INVENTORY OF PROFESSIONAL TRAINING IN TRANSPORTATION

prepared for

TRANSPORT CANADA

by

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INTRODUCTION

Background

The Terms of Reference for this inventory (attached as Appendix A) note:

- *The participation of knowledgeable independent specialists, academics and other professionals, is an important component of Canadian transportation policy development. These transportation experts participate in transportation policy discussions directly through the media, through their research and through the advice they provide to governments and other interested persons and organizations. Transport Canada is concerned that the aging cadre of these experts might not be being replaced by a new generation of experienced specialists. On a more fundamental level, several persons and organizations have suggested that the availability of professional education in transportation and university transportation centres in Canada is not adequate and that there is a shortage of the qualified personnel required by governments and the transportation sector.*

It seems relevant to start by considering why, although transportation accounts for approximately 7% of Canada's economic activity, the demand for university trained transportation specialists would seem at least an order of magnitude lower. The reasons for and significance of this can be considered on three levels.

- (1) Transportation operations require a variety of disciplinary skills, mechanical engineering or psychology for example, that do not constitute transportation in the sense that they would be taught as a pseudo discipline.[1] In this case, transportation is, at best, secondary to the disciplinary expertise.

- (2) Industrial shippers and (particularly road and marine) carriers have traditionally looked on their transportation function, and its management, as below the university trained professional level and certainly not as requiring a graduate degree.

- (3) The job market, characterized by managers without formal transportation training, frequently either does not recognize that transportation programs and transportation specialized graduates exist[2], or does not value the specialized training. The tendency is to hire more generalized skills–for example, commerce or business administration graduates, or clerks–and presume that the required transportation knowledge will be absorbed on the job. A carrier seeking professional employees for its traffic (or marketing) department might look for a marketing specialty; a shipper is likely to look to its junior clerical staff, perhaps from areas such as inventory control or purchasing.

Definitions and Interpretation of Mandate

Slightly edited after the fact, the definition provided by the Terms of Reference indicates:

- *For the purpose of the present inventory, the transportation field is defined as relating to transportation policy and law, and transportation engineering, planning and systems including*

their economics, safety and social, economic and environmental impacts. Training related to the design, construction and operation of infrastructure or vehicles is excluded.

The Terms of Reference also refer to *transportation programs* and to *distinct areas of transportation specialization within other university engineering, social science and business programs*, with a note:

- *Single courses offered by universities and colleges to business, engineering and other students that provide introductory exposure to transportation, but would not constitute a transportation program or specialization are excluded.*

For the most part, transportation is taught in civil engineering, commerce or business administration, law, geography and economics departments. Such a department or faculty may mount a transportation *program* as a concentration or specialty. Such specialization may or may not be formally recognized on the graduates' degrees; however, it is difficult to envisage a program without some form of formal recognition. In the context of the present inventory, it is important to distinguish between an organized transportation program and individual transportation-focussed courses–optional or compulsory–encompassed within more general programs of study.

We note that *Transportation Engineering* is a formally recognized specialization within some *Civil Engineering* departments. Students enrolled in it are prepared primarily for highways and municipal (traffic engineering) employment. To achieve such designation, students must meet specified course and perhaps thesis requirements. On the other hand, most civil engineering programs include one to three compulsory and/or optional roads and transportation courses at both the undergraduate and graduate levels. Faculty members may (or may not) be transportation specialists and focus their research on transport. This can lead the civil engineering faculty members concerned into more multi-disciplinary transportation topics. However, even though broadly based transportation courses can emerge from this interest, it does not constitute a *transportation education program* in the context of this inventory. Yet, as will be seen below, we considered conspicuous such instances worth noting as part of the overall Canadian transportation education picture.

Interpretation of our mandate as regards inclusion and exclusion was difficult, as was the reality that program descriptions must either be sterile or at least partially implicitly address the questions of quality. Noting that Transport Canada elected to direct this assignment to someone who had been called upon to address such issues before, we did not believe that either of these genera of subjective judgements could be totally avoided.

Methodology

The work of this project proceeded on two parallel paths. First, the transportation institutes and centres specified in the Terms of Reference, and a variety of other organizations that we were aware might have a particular interest in professional transportation education, were contacted personally. This included in-person visits to transportation centres/institutes personnel at Dalhousie, U.N.B., Montreal, Manitoba, Calgary and UBC, and to faculty responsible for the transportation programs at École Polytechnique, Université du Québec in Montreal and the "Institut de formation en gestion du transport et de la logistique".

On the second path, we tried to identify every public tertiary educational institution in Canada, plus any private organizations that might have a direct interest in professional transportation education. These included universities, colleges, CEGEPs, community colleges, industry associations and some

larger carriers. High schools and strictly trades or technology training establishments were not included. The resulting list of several hundred institutions was then edited to remove those known to have specific narrow non-transport interests, such as theological colleges. Each was contacted by email and/or telephone a minimum of two and usually three times; almost all responded. In most cases a negative response was accepted as such but there were cases where we continued to pursue our enquiries through other avenues into the organizations. This particularly applied to universities with substantial civil engineering, business or geography programs that reported no transportation education at all, and to some CEGEPs, industry or professional associations and institutes.

For universities that responded to the effect that they did or might have transportation programs, we provided copies of the Terms of Reference (Appendix A) and posed the rather substantial list of questions attached as Appendix B. Most of the universities with substantial transportation programs had little difficulty identifying already available documents–curricula descriptions, faculty assignments, student lists (with thesis topics), faculty curricula vitae, annual reports, NSERC grant applications, etc. that provided the answers to our questions.

A number of respondents perceived–correctly–from the list of questions that we were seeking more than a simple list of programs, that we were seeking evidence of quality (and changes in quality), and of the market (student demand) success of the programs. Understandably, those who were proud of their quality, and those who wished to demonstrate diminished quality, responded very fully in this respect. The same applied to student numbers. Also understandably, there were instances of refusal to address these dimensions of our questioning.

For community colleges, Cégeps, institutes of technology and other providers of non-degree courses in transportation, many of the questions of Appendix B were not relevant. Where such organizations provided a positive response to our initial enquiries, they were sent copies of the Terms of Reference and asked for whatever material seemed appropriate on a case-by-case basis. Course descriptions were particularly sought.

Organization of the Inventory

The report that follows leads off with *Formal University Transportation Centres and Institutes* and particularly the specific centres and institutes specified in the Terms of Reference. It describes their evolution from the *education of students* perspective. Programs actually mounted by the centres and institutes are discussed in this chapter of the inventory. It does not, however, give any level of detail concerning the education programs of the academic departments of the centres or institutes' parent universities. Where applicable, such programs are discussed in the subsequent chapters. We then provide a table indicating the universities included in the inventory and their transportation offerings–except where this is discussed in more detail in other chapters. These instances are indicated in **bold** .

The report then continues with the chapters:

- *University Transportation Education Programs: Social Sciences and Business,*
- *University Transportation Education Programs Within Civil Engineering Departments,*
- *Professional Transportation Education Programs: Non-university Public Sector Educational*

Institutions, and

- *Private Sector and Other Professional Transportation Education Programs.*

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[1] Strickly speaking, transportation is an interdisciplinary field, or an area of interest within a student's chosen discipline.

[2] The employment of civil engineers, specialized in road design and urban traffic planning is a conspicuous exception.

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FORMAL UNIVERSITY TRANSPORTATION CENTRES AND INSTITUTES

General Background

Most of the university transportation centres and institutes specified in the Terms of Reference were participants in Transport Canada's *Transport University Programs (TUP)*. The TUP were initiated in 1969 and continued until 1983-84 at a budget of approximately $1.1 million. Following a program review, the budget was increased to approximately $2.0 million for 1984-85. Funding was reduced for 1985-86 and the TUP were cancelled in 1986. Their budget for 1985-86 was approximately:[3]

- Grants to Transportation Centres $800,000
- Negotiated Research Contributions $490,000
- Graduate Student Fellowships $400,000

For the TUP's final two years, the Centre Grants were provided to:

- The Canadian Marine Transportation Centre at Dalhousie University
- The Transportation Group at the University of New Brunswick
- The Centre de recherche sur les transports at University of Montreal
- The University of Toronto/York University Joint Program for Transportation
- The University of Manitoba Transport Institute, and
- The Centre for Transportation Studies at the University of British Columbia

Through TUP's history, approximately 150 transportation research projects, most in policy, the social sciences and operations research, were funded through *Negotiated Research Contributions* provided through the transportation centres at:

- Dalhousie University
- University of New Brunswick
- University of Montreal
- McGill University
- Carleton University
- University of Toronto/York University
- McMaster University
- University of Waterloo
- University of Manitoba
- University of Calgary, and
- University of British Columbia

In addition to the substantial portion of the research contribution monies that went to student support, the TUP's Fellowship program provided financial support to some 420 students.

The Canadian Marine Transportation Centre at Dalhousie University

In 1977, the *Canadian Marine Transportation Centre* was established at Dalhousie University. It had a specific *research into marine transportation* mandate, essentially following Queen's University's then successful Canadian Institute for Guided Ground Transport (CIGGT) model (described below).

However, unlike the CIGGT, the Dalhousie Centre was dependent on the TUP to a substantial extent. The demise of TUP deprived the Transportation Centre of both base funding to run its office and of Negotiated Research Contributions. As funding for the *Dalhousie Oceans Studies Program* was also ending, the two were merged into the *International Institute for Transportation and Ocean Policy Studies* (IITOPS). In both formats, the Dalhousie centre was primarily associated with the Law and Business faculties of Dalhousie. At that time, Dalhousie had no Engineering program; more recently, it merged with the Technical University of Nova Scotia, (where there happened to be a Transport Canada Motor Vehicle Accident and Defect Investigation unit).

The IITOPS name was cumbersome and the contract work on which it lived changed in nature over the end fo the 1980s and early 1990s. With the retirement of John Gratwick and the reorientation by Mary Brooks towards export research and training for the Department of External Affairs and Trade, transport research quietly disappeared from the activities of IITOPS. As most of the contract research was related to the implementation of the *Law of the Sea* and marine environmental research, the name was changed to the Oceans Institute of Canada (OIC). The OIC, relying almost entirely on contract research, ran into financial difficulty and had to restructure its debts in the mid 1990s. In addition, in 1996, the OIC became a professional membership organization–open to qualified professionals upon payment of annual fees. Although Dalhousie maintains three places on the Board of Directors and it is located on campus, the OIC has essentially moved outside of the university where its operations are funded by contract research, mostly for governments and international development institutions–particularly CIDA. It has no teaching role. Although several Dalhousie academics interested in transportation belong to OIC, participation in its contract research has been limited.

The demise of transportation education at Dalhousie (outside of engineering) has been lagged but related to the demise of the research organizations. The Dalhousie M.B.A. program used to offer a substantial concentration in marine-focussed transportation; however, this is substantially gone. The School of Business now includes, as optional courses under *marketing and transportation*, only a half course in *Domestic Transportation* and a half course in *Logistics Management* (previously called *Physical Distribution Management*). Both are offered in 1999-2000. A graduate course in *International Transportation* is also maintained but it was indicated to us that its continuance depends on the continued presence and interest of Dr Mary Brooks. Six students were enrolled as of October 1999–three of them part time. We were told that 15 students used to be the norm;[4] however, demand has dropped as transport appeals less to business students than do fields such as information technology and finance. Courses in *Transportation Management*, *Ocean Shipping* and *Port and Harbour Management* have been discontinued as have several related courses. A lot more interest in the off-shore oil and gas industry was reported. This is seen as a good source of research funds and a good source of jobs for graduates.

Dalhousie's Marine Affairs Program is proposing a Marine Management Masters program with a transportation stream. Transportation related courses that would be part of a proposed *Transport Policy and Management* stream include *International Transportation* (Business), *Maritime Law and Policy*: *Carriage of Goods by Sea* (Law), *Transport Operations* (Civil Engineering), *Geography of Shipping* and *Geography of Ports*. The program stream would also include some seven mechanical engineering courses related to vessels and off-shore structures and courses focussed on off-shore oil and gas development.

It is also noted that Dalhousie's Law faculty includes one faculty member with transportation interests. Dalhousie's Civil Engineering Department offers graduate level courses in *Highway Materials, Advanced Traffic Engineering, Advanced Highway Geometric Design, Bridge Engineering* and *Transport Operations*, although all of these are probably not offered every year. This is

approximately the norm for civil engineering programs without any particular transportation focus. The Mechanical Engineering Department offers the usual vehicle design offerings but with a conspicuous concentration on marine vehicles.

A particular involvement in special transport courses for industry–a week long session mounted for Irving is particularly interesting–may well be a relict that can be related to the Transportation Centre. However, as of 1999, this appears to be substantially happening on the personal initiative of Mary Brooks.

The Transportation Group at the University of New Brunswick

The University of New Brunswick Transportation Group is multidisciplinary yet it enjoys a strong base in UNB's Civil Engineering Department. The Group has always had non pretentious expectations, and has exceeded them. Research monies from granting agencies and TUP were usually dedicated to student support, and overheads are very low. Loss of support under TUP did not come as as great a blow as it did to most other centres. All members of the Group are fully salaried or emeritus academics, who treat what Group administration there is as an element of their university work load. The core group of career transportation specialists, most (but not all) of whose members are associated with the Civil Engineering department, has been together for several years. Research tends to be focussed on Maritime Provinces issues, particularly those relating to the road and air modes.

The Group's teaching and research are closely integrated, and graduate students play an important role. With a long established position with the Engineering faculty and the UNB hierarchy, and with a proven ability to raise the grant and contract funding required, the UNB Group has achieved general stability. UNB has a Transport Canada funded Motor Vehicle Accident and Defect Investigation unit with a close informal association with the Transportation Group. It plays no teaching role.

The "Centre de recherche sur les transports" at the University of Montreal

There can be little question but that University of Montreal has the most successful transportation research centre in Canada. Annual revenues in the $2 to $3 million range have been maintained for almost two decades. It is probably larger than all other Canadian centres combined. The Centre's international reputation is important. It is active on five continents and receives strong support from the university and the provincial government. When the TUP program was cancelled, the province moved to increase its contribution. The Centre can count on its polished fund raising skills and experienced members to keep funds flowing.

The Centre de recherche sur les transports (CRT)[5] was constituted by the University of Montreal in 1971. Until approximately 1987, the Centre and its activity grew substantially but then student enrollment stalled. In 1989, the U of M was joined in its CRT initiative by the École des Hautes Études Commerciales (HEC) and École Polytechnique de Montréal. Situated on the U of M campus, the CRT is dedicated to transportation research and development, the training of transportation professionals, and transportation technology transfer–university to industry. Most recently, the CRT has informally expanded its mandate to include telecommunications. CRT indicated that its principle areas of interest are:

- transportation systems planning,
- transportation network analysis,
- intelligent transportation systems,
- the economics of transport and transportation policy,
- transportation safety,
- infrastructure planning and maintenance information systems, and
- telecommunications network modelling.[6]

The CRT's training objective is focussed on the guidance and supervision of young research professionals and graduate students including Post-doctoral researchers and research associates as well as Masters and Doctoral students. The CRT mounts two interdisciplinary courses/seminars[7] and other less formal research seminars but, beyond that, it does not itself have any formal education programs. Instead, it provides an infrastructure and serves as a catalyst for graduate studies in transportation. Under supervision, students are integrated into the CRT's research projects.

Of the 48 members of the CRT, some 22 are faculty members of the University of Montreal, six are with HEC and nine with École Polytechnique. Of the remaining members (not with the host universities), seven received their doctorates from one of the CRT universities and most are faculty members of other Montreal area universities. Conspicuously, only a single CRT member is with a Civil Engineering department. Most are social or management scientists. More broadly, disciplines include operations research, mathematics and statistics, economics, management science, geography, demography, computer science, preventative medicine and psychology.

There is a *hard core* of approximately 20 academic members for which CRT is their main affiliation and the designation for their FCAR[8] grants. Others do some of their work with CRT and a few are inactive. We were told that four or five of the CRT's members belong for the purpose of participating in a mathematics modelling laboratory; however, most are dedicated transportation academics. The draft 1998-1999 *Annual Report* indicates that ten of these academics are assigned to the CRT on a half time basis (presumably relieved of half of their normal teaching duties. There is also a staff (research professionals without academic appointments and support staff) of 15 to 20. We were told that CRT has approximately 100 active research projects and observe that 65 reports were published by the CRT in 1997-1998. Presumably, most of these signify project completions.

Revenues of the CRT for 1997-98 were approximately $2.5 million.[9] This is about the average for recent years; the range over the last five years was $2,373,000 to $2,745,000. 1997-98 research grants to the CRT and its members of $1,767,000 included NSERC grants totalling $761,000, SSHRC grants of $78,000, and grants from *Fonds pour la formation de chercheurs et l'aide à la recherche* (FCAR) of $525,000.[10] A further $159,000 for a road safety research program was provided by the MTQ and the Quebec (public) automobile insurance company. There is also contract research funding including $200,000 from the MTQ in 1997-98.

The CRT's draft 1998-1999 Annual Report indicates five Visiting Researchers and 19 Post Doctoral appointments. Some 46 Doctoral and 56 Masters students with theses directed or (in a few cases) co-directed by members of the CRT are listed as well as 14 students who have not reached the thesis stage. Not all of these are transportation students; however, inspection of thesis titles indicates that most are. We would estimate that approximately 30 transportation (according to the definition for this inventory) Masters and Ph.D. students associated with the CRT would graduate annually. This output substantially exceeds that of any other Canadian program.

The CRT and its associated academics have a high internationai profile. Some students are attracted to the CRT and the university faculty members associated with it, and they come to Montreal and U of M, HEC and Polytechnique deliberately to study transportation. A lot of these are from Europe. Other graduate students arrive by accident–at least from their perspective it is accidental. They are brought into the CRT by their supervisors. We were told that a *huge group* from the Masters program at HEC arrive at CRT (and become transportation specialists) in that way.

Carleton University Transportation Research Centre

Once quite active, the Carleton University Transportation Centre, considered an *Organized Research Unit* by the university, was–in our understanding–fading while TUP still existed, its management essentially shrinking to a single professor. We were told that the Unit, remains active in serving the needs of the transportation community and provides opportunities for graduate students to work as research assistants to gain research experience. The participants in the interdisciplinary research are reported to include faculty members from the Department of Civil and Environmental Engineering, the Carleton and University of Ottawa Departments of Geography, the Department of Mathematics, and the Department of Sociology & Anthropology, as well as adjunct professors. We were told that co-operative research is underway with the Royal Military College. Current projects include demand management, sustainable transportation, energy and emissions, intelligent transportation systems, and pavement management. These are supported by the Natural Science and Engineering Research Council of Canada, the Regional Municipality of Ottawa-Carleton, and La Société de transport de l'Outaouais.

Carleton's Civil Engineering graduate transportation programs are discussed below.

Queen's University's Canadian Institute of Guided Ground Transport

The Canadian Institute of Guided Ground Transport (CIGGT) at Queen's University was founded in 1971 and disbanded in 1994. The CIGGT was a research organization with no formal teaching mandate. In 1988, however, it developed a railway engineering (where an engineering background was not a prerequisite) M.Sc. program in conjunction with the Civil Engineering Department. Demand for such graduates, presuming an anticipated initial spate of enthusiasm, was not proven. On the less formal side, CIGGT had a major incidental effect on transportation education at Queen's through the relatively large sums of research monies it provided to academic researchers–at least through its earlier years.

The CIGGT received only a very small portion of its funding from the TUP, so small that its fortunes were independent of TUP. CIGGT was initiated as a (not formal) partnership of Queen's, CN, CP and the Canadian Transport Commission (replaced by Transport Canada). Through much of its history, each partner made an annual base funding contribution, and contract research provided additional revenue. Direction was by a Board of Directors with sponsor membership but a slight majority of Queen's appointees. Work was focussed on, but not always restricted to, rail. At its peak, CIGGT had over 20 full time employees, including 15 research staff in a cost recovering satellite unit. There were more than forty academic research associates, working with academic freedom under the project administrative guidance of institute staff.

Research policy was clear, if largely unwritten. All contract research reports were subject to review by the sponsor, but publication was mandatory, even of failures. Confidentiality was not entertained. Sponsors' projects were given preference, and small advisory tasks for sponsors were performed without charge (or sometimes record). Contract work contributed to overheads; there was an occasional surplus, and sponsors' contributions were adjusted annually to leave the institute solvent but not rich.

Graduate students, and some undergraduates, essentially followed their professors into the transport field. Of course, virtually all Queen's faculty with a teaching interest in transportation became involved with CIGGT and, in a number of cases, faculty members that had not previously been specifically interested in transportation were attracted to the available research funding–and brought their students with them. The presence of CIGGT also attracted engineering and business faculty members interested in teaching transportation to Queen's and/or influenced the faculties to recruit such persons. The net education result was a variety of (especially M.B.A. and engineering) graduates entering the transportation field and particularly the railway industry, many if not most of whom were not seeking a transport career when they arrived at Queen's.

After its first ten years, CIGGT started to evolve in a different direction. Sponsors were expanded to include VIA Rail and Urban Transit Development Corporation. Sponsors' representatives on the Board were downgraded several levels[11] and eventually the Board was disbanded. Focus shifted towards the more lucrative U.S. market. Confidential consulting work was entertained. A policy of full cost recovery was adopted.

CIGGT continued to operate in the railway consulting field including overseas work. The intention was to make money and to survive over the long term. Academic participation in CIGGT projects dropped off even though it became reasonably profitable for the departments concerned. Attempts to overcome an orphan psychology included appointments for three member of the Institute's senior staff, not all civil engineers, as adjuncts with Civil Engineering and an interdisciplinary Masters program in Railway Systems Analysis sponsored by Civil. Yet, CIGGT's distance from the academic functions of the university grew and student participation shrank until its eventual demise.

The University of Toronto/York University Joint Program for Transportation

Prior to 1986, the U of Toronto/York U Joint Program included a broad range of participation from different disciplines in both universities, and offices in a separate building on the U of T campus. A full time staff of six to eight included four research professionals. Academic associates would have numbered 20 to 30. The Toronto/York joint program was the largest recipient of TUP funding, and it seems valid to attribute Toronto/York's demise to the end of the TUP. In the latter years of the Joint Program it received more than $200,000 annually in TUP base funding alone. The Program was more dependent on TUP as a source of funds than any of the other university centres. With the demise of TUP, it faded to a shadow, but was (at least initially) retained presumably as a shell against the possibility that funding might again become available.

Participation in research sponsored by or through the Joint Program extended to Business Administration, Economics and Political Science faculty in both universities as well as those from Civil Engineering at U of T. Much of this participation involved graduate students and provided them with funding. Toronto/York was seen as a good venue for students interested in transportation, and transportation related research was an attractive means of obtaining funding for graduate students in

a wide range of disciplines who happened to be at Toronto or York. To a large extent, this transportation educational activity either ended abruptly with TUP and the Joint Program or faded as transportation faculty retired or left for other reasons. Whatever the reason, the universities concerned did not stand behind the Joint Program when it turned from a source of overhead funds to an expense. In this regard, the joint sponsorship has been cited as detrimental; the Program and its staff could not fade back into either university.

There is still some of the transportation research being carried out through the *Joint Program in Transportation*, much of it centred around the administration of data files on urban travel from the 1986, 1991 and 1996 *Transportation Tomorrow* surveys. Some fifteen research reports were published by the Joint Program in 1998 and 1999. Continuing educational activity (after the substantial demise of the Joint Program) has been concentrated with the U of Toronto transportation program of the Department of Civil Engineering. As is discussed below, the Department awards Masters degrees in transportation, with transportation students from disciplines other than engineering, for example management, accepted. This program is further discussed below.

The University of Waterloo Transportation Centre

Even before the demise of TUP, the interest of most of the University of Waterloo faculty members who participated in the Transportation Centre was diverted into a new organization devoted to risk management. Some of its activities involved transportation (and were sponsored by Transport Canada), others were broader. Although it is not clear whether a formal Transportation Research Centre organization remains, University of Waterloo has generally maintained a substantial transportation teaching and research program, primarily within the Department of Civil Engineering (where the Transport Group was one of five organized research groups). It has a strong operations research focus and important reputation for quantitative work. Focus is largely, but not exclusively, on the road mode. This is further discussed as an educational program below.

The University of Manitoba Transport Institute

The University of Manitoba Transport Institute (UMTI) was founded only two years before the end of the TUP. Establishment of the Institute was one of the elements of the initiative of the then Minister of Transport, Lloyd Axworthy. It succeeded U of M's Centre for Transportation Studies that had been established in 1967. The old Centre's *modus operendi* was quite different from that of the Institute and examination of changes to transportation education at the University of Manitoba from the Centre to the Institute reflects shifts that appear to have broader relevance. The Centre's activities were mostly funded with annual TUP grants, Manitoba Department of Highways and Transportation grants and TUP Negotiated Research Contributions–$47,500, $12,000 and $23,520 respectively in 1981-82.

The 1983 Transport Canada program *Review of Transport Canada University Programs*[12] commented concerning the Centre *"This is par excellence an inter-disciplinary program . . .".* In its Annual Report, the Centre listed 38 members of faculty as members of the Centre. Twenty-one Centre sponsored research projects were divided among 14 faculty members representing seven different faculties or departments of the university. The Report also indicated 45 transportation or transportation related courses at University of Manitoba, some 19 of which included the word transport(ation) or equivalent description in their titles.[13] Six Ph.D. and 12 Thesis Masters students

are listed with the titles of their theses. Of these, eight were affiliated with the Civil Engineering Department, five with Economics, and five with Agricultural Economics.

The above data, and especially Civil Engineering's four undergraduate and seven graduate courses listed under the title *Transportation Planning and Traffic Engineering*, will be discussed further below–in contrast to what is now offered at University of Manitoba. It is important to note, however, that it is impossible to really distinguish between the effects of:

- student and job market demand,
- funding changes over the period (pre and post TUP), and
- the Centre to UMTI organizational change.

The Centre did not offer any formal courses (although its Seminar Series–with invited speakers–was a prominent component of its program). It is understood that physical facilities were limited to a small office and paid staff limited to part time secretarial and library assistance. The 1983 Transport Canada program review noted that the Centre lacked a well defined physical location which restricted internal communication and that it suffered from a lack of full time or part time staff. The review closed its discussion of the Centre by noting that it *"received minimal institutional support"* and that *"more substantial institutional support as a correction to undue dependence on the commitment of faculty members"* was called for.

The UMTI was envisaged as a substantial expansion of transportation research and education activity at University of Manitoba, beyond what the Centre for Transportation Studies model would–in practice–allow. But, it was launched into a soon-to-change environment. Federal operating cost support expired in 1986. Untied financial support by the Province of Manitoba ended in 1990. The Institute's objectives remain transport (and logistics) education and research, but it has had to rapidly evolve into a market sensitive entity that survives substantially on contract research funding and consulting revenue. Its educational activities also have to be revenue focussed.

UMTI has a substantial suite of offices and other facilities within a building built with federal and provincial funding, substantially on the basis that it would house the Institute–it is entitled to more space than it currently requires. It has a paid support staff (at an annual cost of approximately $150,000,[14] excluding the Director's salary[15]) to provide the rapid response capability that is necessary in the contract research/consulting business. UMTI's consulting and contract research commitments are met through the employment of paid Research Associates. The Director dedicates a large portion of his time marketing–both direct selling and maintaining a high level of public visibility for the Institute and himself (including 114 personal media contacts in the first 10 months of 1999). Yet, there may be little option; UMTI has evolved with a high degree of self-sufficiency in mind.

Of UMTI's part and full time management and administrative staff of six, one is a doctoral candidate (not U of Manitoba) who also gives a ½ course in logistics. Also included, with responsibility for *Strategy and Business Development*, is a former senior executive with CN Rail. Six research associates–predominantly Masters graduates–also include a doctoral candidate, but from Memorial University–not U of M. The Institute also involves a variety of transport professionals from outside of the university in its operations. There is relatively little direct participation of tenured academics (with their students) in UMTI's contract work. Timing is crucial for academic participation, and contract work is less suited to their time priorities than was the grant and negotiated contributions research under the Centre and TUP.

Three graduate students–two in geography and one in history–are listed with two undergraduates as

UMTI *Research Affiliates*. Presumably, this represents support of their transport related education, at least partially through part time work on UMTI contracts. Also, the Director has teaching responsibilities and some Associates give ½ courses. Most of UMTI's educational initiatives are not related directly to the university's core intra-mural programs. Rather they involve *distance* and *continuing* education. The fact that UMTI has elected to go in this direction may indicate an important change in the 1990s market for transportation education.

UMTI aspires to offering a Masters program in transportation and logistics. It is not clear whether this will occur and how and by whom the teaching will be done; however, the Institute is starting to build on a more basic community and industry level.

In 1997, UMTI developed a *Certificate in Logistics* program in coordination with the Canadian Institute of Traffic and Transportation (CITT) and mounts six courses–all but two given by outside lecturers–in conjunction with Red River Community College. The UMTI courses, three of which are transportation and the others on related topics, are:

- Logistics Fundamentals
- Economic Applications in Transportation
- Legal Issues in Transportation
- Transportation Policy and Regulation
- Marketing of Services
- Risk Assessment and Safety

Some 152 students in six UMTI courses,[16] are reported. Three of these courses are recognized by the CITT for level II of its curriculum, and three are recognized for level III. UMTI's 1998-99 course tuition fee revenue was $40,600, probably mostly from these courses. Students apparently paid a fee of $350 per course (3 hours per week for a semester) in 1998-99. For 1999-2000, the fee schedule includes a $50 program fee plus $495 per course. The year to year increase is interpreted as indication of market success.

An airport management course for the Winnipeg Airports Authority began January 2000. One to 5 day seminars/short courses directed to industry's perceived needs are being developed. UMTI is also seeking funding for the endowment of a chair in transportation and logistics and the establishment of a *"Centre of Excellence in Transportation and Logistics with appropriate support from the university, government and industry"*.[17]

The formal program of undergraduate and graduate transport education at the University of Manitoba is not directly related to UMTI. In this respect, we note that (although not a transportation *program* under our Terms of Reference) the University's Faculty of Agricultural and Food Sciences requires all undergraduate agribusiness students to take courses in transportation economics and logistics, and that equivalent courses are offered to agricultural economics graduate students. That noted, the only program identified as warranting specific mention in the present report is that offered by the Civil Engineering Department. This is discussed below.

The Van Horne Institute's Centre for Transportation Studies at the University of Calgary

The Van Horne Institute's Centre for Transportation is the successor to a series transport-focussed institutional initiatives at University of Calgary. Calgary is a transportation oriented community with

major transport companies headquartered in the city. The university has a history of faculty interest in transportation dating back to its early days as a university. During the TUP, Calgary was eligible for negotiated research contributions; however, at least in the latter years of the programs, there were relatively few Calgary applications. A proposal in the early 1980s that sought substantial government funding for a transportation centre that included links with Alberta's energy industry apparently met with little early success.

By the late 1980s, however, the University of Calgary had a small interdisciplinary Institute for Transportation Studies. Half a dozen researchers produced funded and unfunded studies relating to air, marine, rail, road and urban transportation. By the end of the decade, however, the Institute was virtually dormant. There remained a Transport Canada funded Motor Vehicle Accident and Defect Investigation unit and transportation activity in academic departments that was unrelated or only vaguely related to the Institute. University of Calgary's strength in transportation was in the Civil Engineering Department and was strongly roads design–infrastructure–focussed.

The Van Horne Institute for International Transportation and Regulatory Affairs was launched in about 1992. It appears that Van Horne's programs are really in an early stage and substantial continuing development is contemplated. The fields of interest of the Van Horne Institute are broader than transportation. And, as well as the broader context of regulatory affairs, the Van Horne defines transportation more broadly than is customary for most institutions. Quite correctly, in our view, the Institute includes as transportation the transmission of electricity and other energy products (oil and gas), and it also includes telecommunications. Clearly, with the thin market for transportation education and research, a broader perspective makes good practical sense.

The Van Horne Institute has been affiliated with the University of Calgary since 1992 and with the University of Alberta since 1998. The affiliation status allows the Van Horne to have a higher degree of flexibility within the University and line departments. The Institute occupies a small suite of offices on the University of Calgary campus. The Van Horne has also entered into an affiliation agreement with the Southern Alberta Institute of Technology (SAIT). SAIT offers transportation courses, which the Institute intends to add to the training structure currently developed by the academics at the university level.

Membership in the Institute is open to all companies with an interest in transportation or regulatory affairs. Most of the 53 member companies are major corporations with substantial interests across Canada. (It should be noted that the Institute is financed almost entirely through contributions from its membership.) The Van Horne Institute's Board of Directors is responsible for policy and consists of approximately forty representatives of the communications, transportation and consulting industries, six members from the University of Calgary, two members from the University of Alberta, and one from Southern Alberta Institute of Technology.

In response to the direction from its membership to facilitate the establishment of courses and research in transportation, the *Centre for Transportation* and the *Centre for Regulatory Affairs* were founded. The Institute has also developed a *Centre for Information and Communication* in collaboration with the University of Calgary and the University of Alberta. Each Centre has a steering committee consisting of representatives from industry and the academe. We were told that the steering committees are charged with the development of research programs and educational curriculum/workshops/ seminars.

The stated activities of the Centre for Transportation are:

- a transportation minor degree program with the Faculties of Social Sciences and

Engineering,
- a concentration in transportation and logistics program with the Faculty of Management,
- a transportation graduate scholarship program,
- a research program, and
- continuing education courses

Four of the five are education related. As for the *research program*, no evidence of particular research projects or an increase in U of Calgary's transportation research output under the auspices of Van Horne was found. The only publication promoted in its Fall 1999 *Newsletter* was entitled *"Moving Forward" A Guide on the Importance of Transportation in Canada*. This would appear to be an industry promotion (rather that research)–which may well be an effective approach for an organization seeking to get established in the funding environment of 1999.

Our attention was drawn to a publication entitled *"Traditional and Incentive Regulation"* by Professors Mansell and Church, and we were informed that the Institute annually supports a research fellowship and is proposing to increase that number as finances warrant. A recent example of sponsored research was a paper on *Hydrogen Diffusity in Materials* produced by Dr. Shaw of the Department of Engineering, University of Calgary, and it was indicated that this work has significant value for the pipeline industry.

The Van Horne informed us that there are transportation minor degree programs in the Faculties of Social Sciences and Engineering. The Department of Civil Engineering has long established roads-focussed transportation programs at the undergraduate, Masters and Ph.D.. levels which we discuss separately.[18] The Department is closely affiliated with *Centre of Transportation Engineering and Planning* which, like Van Horne, is a membership organization that offers short courses to industry. It was apparent from our meeting with Van Horne in Calgary and subsequent discussions that the relationship between the Civil Engineering transportation program and Van Horne has, at least until very recently, been marginal.

The Van Horne Institute told us that it is facilitating the development of transportation courses that extend through transportation geography/law/ management/environment/economics to political science, etc. The Geography Department has two faculty members who are closely associated with Van Horne (both of whom we met during our visit to Calgary); one is Academic Director of Van Horne's Centre for Transportation as well as an Assistant Professor with the Department (the other is the Centre's previous Academic Director). The Department appears to have taken the lead role in a *Transportation Theme School* sponsored by Van Horne that leads to an "interdisciplinary" *Transportation Minor*. Promoted as a *mix of theory and practical experience that will help* [the student] *in gaining employment*, the curriculum (which we were told will be expanded) is:

- one (undergraduate) Geography course, *Transportation Science*,
- one Civil Engineering course, *Introduction to Transportation Planning*,
- a group project in transportation issues, and
- a supervised independent research project in transportation issues.[19]

We were told that enrolment in the Geography course has grown from 26 in the Fall of 1998 to 71 in the Fall of 1999. Enrolment in the Civil course (compulsory for all 3rd year Civils) grew from 47 to 54. Enrolment figures, provided by Van Horne for other transport related courses at the University of Calgary are:

Courses	Fall 98/99	Fall 99/00
ECON 371	25	42
ECON 477	19	42
GEOG 341	31	35
POLI 357	24	28

The planned *concentration in transportation and logistics with the Faculty of Management* is at a still earlier stage of development. It received approval in the Fall of 1999 and is to be built on the foundation created by the Transportation Theme School courses. Interdisciplinary course offerings are to cut across departmental boundaries.[20]

The Van Horne Institute has been successful in establishing five industry sponsored scholarships. The Centre for Transportation also offers $1,000 to the transportation theme school student with the highest grade point average. The Van Horne Institute is currently instituting a program of internships with member companies for students in the regulatory economics stream to undertake Summer projects.

The Van Horne Centre has developed six continuing education courses:

1) *Physical Distribution and Logistics–in* partnership with CITT, 3 (evening) hours weekly for one semester.

2) *Executive Strategies for Transportation Projects*–taught in the evenings for a semester. The program utilizes case studies and is taught by a transportation practitioner in Calgary.

3) *Supply Chain Management*–courses have been delivered to the management of a major trucking company. Similar courses will be developed in conjunction with academics at the affiliated University of Alberta.

4) *Processed Based Modeling*–four weekly classes of 3 (evening) hours.

5) *Decision Support Systems and Environmental Planning in the Transportation and Related Sectors*–January 4 to 8, 1999 and January 3 to 7, 2000. This block week course will be repeated as academic instructor time becomes available.

6) *Transportation Economics*–in partnership with CITT, 3 (evening) hours weekly for a semester. As noted in the chart above, transportation economics is also taught as a separate undergraduate course at the University of Calgary during the winter term..[21]

With the exception of the Supply Chain Management course, none of these continuing education offerings is taught by a University of Calgary academic. In Van Horne's view, the courses delivery by industry practioners is a benefit for students. This situation, and indeed the Institute's general education approach, is similar to that of UMTI (as discussed above). In our view, what this may indicate about the market for transport related education as of 1999 could be important.

Additional comment by Van Horne is included in Appendix C.

The Calgary situation is very difficult to assess. The substantial discussion above notwithstanding, Calgary does NOT have an operating transportation program at the graduate level (except for the Civil Engineering program discussed below). Nor does the undergraduate program amount to more than other universities offer–except for the project and financial support provided by the Van Horne. Yet, in our view, the Calgary situation may be a very important *barometer*.

Transport education is being aggressively promoted by the Van Horne Institute and its full time President. Of course, progress is slow but, in the university environment, this is inevitable. Existing faculty must be diverted; other specialties will have to give way. The success of this initiative will not be known for several years.

The Centre for Transportation Studies at the University of British Columbia

The University of British Columbia (UBC) has a Centre for Transportation Studies (CTS) and, very closely related to it, a formal transportation specialization within the Faculty of Commerce and Business Administration. Attempts to extend the Centre's program to other faculties were never very successful, even with the TUP funding. This includes the transportation program in the department of Civil Engineering. Until about 1997, the UBC Centre officially reported to the Senate of the University through the Dean of Graduate Studies; however, although it was supposed to embrace various faculties, Commerce faculty and students did much more research with the CTS than was the case for others. It now operates within the Commerce faculty. Commerce took the CTS over essentially because there was little or declining interest in transport among other faculties on campus. Thus, we have elected to discuss the Commerce transportation education programs associated with the Centre separately below.[22]

The Centre has its own modest premises with offices and a meeting room. It received base funding and competed for Negotiated Research Contributions and graduate student fellowships under the TUP. The Centre publishes the Logistics and Transportation Review (*Transportation Research E*). The University has supplied space and utilities for CTS for many years, but it is necessary for the Centre to raise money to operate, including the salary of its one-person support staff. Annual income of about $30,000 from a UPS Foundation Grant is administered by the Centre for Transportation Studies. These funds support transportation research generally and are also used to offer some graduate fellowships. Under most circumstances the granting councils–SSHRC and NSERC–do not include allowances for overheads. The CTS carries out some contract research studies for public agencies but these bear a 34 percent overhead charge by the University, only some of which accrues to the Centre. Since the demise of the TUP, the CTS has survived largely on a combination of small projects, sales of books and papers, donations, profits from seminars or conferences, training sessions for foreign visitors and support from the Faculty of Commerce.

The CTS facilities provide space for graduate students, research assistants and for temporary visitors. However, the facilities had become very rundown and its equipment outdated, and in the summer of 1999 the Dean of Commerce advanced the funds for a minimal upgrade of the building. The facilities have been spruced up but a problem of obsolete computers remains. Funding assistance is being sought; however, the Centre's Director reports that funds have become tighter and that donors increasingly look for specific payoff for their money. He also noted that, without the infrastructure and ongoing existence of centres or institutes, it is very difficult to sustain a cadre of interested students and faculty available to respond to research requests. The approaches of UMTI and Van Horne, discussed above, reflect this situation–although their response has been quite

Various initiatives to find additional funding to put the Centre for Transportation Studies on a stronger financial basis are underway. One is to increase the number of industry/government partnerships for specific research studies. This would be done in combination with expanding the M.Sc. transportation program, with the students working on the projects. However, specific projects are not seen as sufficient to foster a long term perspective for the CTS. Larger long term projects–international projects with several partners but headquartered at UBC are being sought.

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[3] *University Linkages to Transport Canada, Transport Canada Research and Development Directorate, September 1985.*

[4] *Classes of 20 to 30 students were reported as late as the early 1990s.*

[5] *The CRT's English language name is Centre for Research on Transportation.*

[6] *It is unsderstocd that the CRT has an agreement with Bell Mobility for work in this area.*

[7] *These seminars for Masters and Ph.D. students cover a variety of transportation topics including intelligent transportation systems, road safety, transportation network modelling, logistics, etc. They often include visiting lecturers from other Canadian universities and overseas. For University of Montreal students (the majority of the participants), these seminars each count for 3 credits. Some students from other Montreal universities also attend.*

[8] *FCAR, one of two principal providers of infrastructure funds for the CRT, is an agency of the Quebec Ministry of Science and Technology. It is discussed further below.*

[9] *This figure and some of the other information here was taken from the CRT's 1997-1998 Annual Report.*

[10] *The FCAR, a program of the Quebec government, provides approximately $50 million in graduate scholarships and research funding to Quebec universities annually. It has no real counterpart in the other provinces.*

[11] *This most unfortunate turn in CIGGT's fortunes was due to several factors, among them the appointment of a low level representative by one sponsor and reaction of the other sponsors to him, and increased reference of accounting matters to the Board.*

[12] *Studnicki-Gizbert, K.W., Review of Transport Canada University Programs, Delcanda International*

for Transport Canada, April 1983.

[13] *Studnicki-Gizbert, op cit., writing one year later reported 17 transportation courses in five departments as well as a large number of transportation related courses.*

[14] *Base funding of $150,000 is provided by the university.*

[15] *The Director's salary is covered by the Faculty of Agricultural and Food Sciences, and this Faculty has also undertaken financial and accounting responsibility for UMTI.*

[16] *There are apparently also four matching Red River Community College courses.*

[17] *Five Year Review of the Transport Institute, October 1999, page 56.*

[18] *These are described under UNIVERSITY TRANSPORTATION EDUCATION PROGRAMS WITHIN CIVIL ENGINEERING DEPARTMENTS below.*

[19] *A list of available topics included cooperating/sponsoring industry contacts. These topics were: GIS analysis of markets and routes, the feasibility of a new access road/interchange, pipelines stream crossing methods, field metering of oilfield production, impacts of deregulation on a pipeline operator, energy generation loss assessment, analysis of change in the grain transport system, and an oil pipeline feasibility assessment.*

[20] *The courses to be covered in the concentration are:*

FOUNDATION COURSES (2) *Two required courses:*
TRAN 301 Transportation Systems and Analysis
OPMA 401 Materials and Supply Chain Management

PROJECT COURSE (1) *Any one course from the following list:*
TRAN 499 Group Projects in Transportation Issues
OPMA 411 Field Investigation in Operation Management

FOCUS COURSES (3) *Three courses from the list below. At least one of these courses must be in the Faculty of Management, and at least one of these courses must be outside the Faculty of Management.*

Outside the Faculty of Management
ECON 371 Economic Analysis of Transportation
ECON 477 Regulatory Economics (1)
GEOG 341 Introduction to Economic and Transportation Geography (2)
POLI 357 Introduction to Public Policy Analysis
TRAN 473 Introduction to Transportation Planning

Inside Faculty of Management
HROD 445 Labour Relations
HROD 493 Business Negotiations
MKTG 433 Business to Business Marketing
MKTG 487 Services Marketing
OPMA 405 Service Operations Management
OPMA 407 Introduction to Project Management
OPMA 409 Simulation of Operational Systems

Notes: ECON 477 has ECON 301 or 309 as a prerequisite

GEOG 341 has GEOG 201 and 213 as a prerequisite

[21] *We were told that Van Horne pays the cost of the transportation economics course.*

[22] *Also discussed below is UBC's graduate transportation engineering program mounted by the Civil Engineering Department.*

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TABLE OF UNIVERSITIES

ALBERTA		
Athabasca University	Athabaska	Reported no courses in transportation.
University of Alberta	**Edmonton**	**"The University of Alberta offers many degrees but nothing towards a degree in transportation." The Civil Engineering department has discontinued its graduate program in transportation but continues to offer a few undergraduate courses. See text.**
The University of Calgary	**Calgary**	**A transportation concentration is available in Civil Engineering and a few transportation courses are offered under the heading Transportation Theme School. See text.**
The University of Lethbridge	Lethbridge	Reported that it does not offer transportation courses.
BRITISH COLUMBIA		
The University of British Columbia	**Vancouver**	**See text for description of Transportation Centre and transportation programs in the Commerce Faculty and Civil Engineering.**
British Columbia Open University	Burnaby	Reported no transportation offerings
University of Northern British Columbia	Prince George	The University of Northern BC does not offer any transportation courses.
Royal Roads University	Victoria	Royal Roads University does not offer any transportation program or courses.
Simon Fraser University	Burnaby	Response indicated no transportation programs offered. Two transportation economics courses are offered.
Trinity Western University	Langley	In conjunction with Coastal Pacific Aviation and University College of the Fraser Valley, students can earn a B.A. with a special concentration in Aviation.
University of Victoria	Victoria	No courses in Transportation, either in engineering or in the Business School.
MANITOBA		
Brandon University	Brandon	Brandon University does not offer programming in transportation specifically.
The University of Manitoba	**Winnipeg**	**See text for description of Transportation Centre and courses.**
The University of Winnipeg	Winnipeg	[Does not appear to have any relevant courses.]
NEW BRUNSWICK		

Université de Moncton	Moncton	Nous n'offrons pas de programmes avec une concentration en transportation
Mount Allison University	Sackville	There are no such programs at Mount Allison University
University of New Brunswick	**Fredericton**	**Transportation centre and programs. See text**
St. Thomas University	Fredericton	Not included in survey.
NEWFOUND AND LABRADOR		
Memorial University of Newfoundland	St John's	Does not offer any programs of instruction with a concentration of courses in transportation. [The Marine Institute offers BA program specifically designed for marine transport personnel.]
NOVA SCOTIA		
Acadia University	Wolfville	Acadia does not offer any specializations in transportation issues We do offer a 3-hour course entitled The Economics of Transportation.
Dalhousie University	**Halifax**	**Some transportation courses but no longer has a full program. See text.**
University of King's College	Halifax	Not included in survey.
St. Francis Xavier University	Antigonish	Does not offer transportation courses.
Mount Saint Vincent University	Halifax	[No courses appear to be relevant to transportation.]
Université Sainte-Anne	Pte-de-l'Eglise	Not included in survey.
Saint Mary's University	Halifax	Response indicated no transportation programs offered.
ONTARIO		
Brock University	St Catharines	Brock University does not have any programs or courses specializing in transportation.
Carleton University	**Ottawa**	**Has transportation program in Civil Engineering see information in text.**
University of Guelph	Guelph	Response indicated no transportation programs offered.
Lakehead University	**Thunder Bay**	**A few transportation courses in Civil and Economics are offered. As well, Lakehead has established a Transportation Research Centre. See text.**
Laurentian University of Sudbury	Sudbury	Laurentian does not offer any courses and/or specialized program in transportation.
University of Sudbury	Sudbury	[No departments relevant to transportation.]
McMaster University	Hamilton	McMaster does not offer a program with a concentration in transportation. The Civil Engineering Department has two professors with an extensive research interest in transportation. There are four undergraduate courses in the transportation area: CE 3K03 Introduction to Transportation Engineering CE 4D04 Geometric Highway Design

		CE 4H03 Land Use and Transportation (offered with Geography/Geology) CE 4G03 Pavement Materials and Highway Design Currently does not offer a graduate program in the transportation area.
Nipissing University	North Bay	Nipissing University does not offer transportation.
University of Ottawa	Ottawa	Response indicated no transportation programs offered in the social sciences. The transportation program in Civil Engineering is offered in conjunction with Carleton.
Queen's University at Kingston	**Kingston**	**Little transportation remaining at Queen's; see text.**
Royal Military College of Canada	Kingston	Not included in survey.
Ryerson Polytechnic University	**Toronto**	**Courses in Civil, Urban Planning and Economics. Information included in text.**
Saint Paul University	Ottawa	Not included in survey.
University of Toronto	**Toronto**	**Transportation program in Civil Engineering reports a healthy enrollment. See text.** **A Professional Pilot and Aviation Management Program is offered by the Faculty of Engineering in conjunction with the Institute for Aerospace Studies.** **Professional Development Centre offers various courses.** **[There is an executive program of some type. Information was not provided.]**
University of St. Michael's College	Toronto	Not included in survey.
University of Trinity College	Toronto	Not included in survey.
Victoria University	Toronto	Not included in survey.
Trent University	Peterborough	Trent does not offer any program with a concentration of courses in transportation.
University of Waterloo	**Waterloo**	**Offers a transportation program in Civil Engineering. See text.**
St. Jerome's University	Waterloo	Not included in survey.
The University of Western Ontario	London	Western introduced a Commercial Aviation Management Stream with our Bachelor of Administrative and Commercial Studies degree program this year. To our knowledge this would be the only program that relates to transportation. The Ivey business school has one logistics course and some transportation component in one of its operations management courses. There are no transportation courses in engineering.
Brescia College	London	Not included in survey.
Huron College	London	Not included in survey.
King's College	London	Not included in survey.
Wilfrid Laurier University	Waterloo	One Transportation Economics course and some transportation students.

University of Windsor	Windsor	The Faculty of Law has a few courses that 'touch' on aspects of transportation law and in some instances have used the transportation sector as a focus. Examples of such courses include: administrative law, judicial review and regulated industries. The Civil Engineering program includes two courses which deal with transportation. One is Transportation and Traffic Engineering (87-314) and the other one is Highway Design and Construction (87-414). Windsor also has a graduate course in the materials area that deals with the durability of some of the pavement materials.
York University	Toronto	York reported that it does not offer any program in transportation. There is a program in Urban Studies, but it does not contain any specialization in transportation. Professor Ron House echoed this statement noting: "To my knowledge there are no transport economics course offered at York. I believe I was the last person to teach such a course and that was several years ago. This course was a victim of the budget cuts."
PRINCE EDWARD ISLAND		
University of Prince Edward Island	Charlottetown	UPEI does not offer programs in transportation.
QUEBEC		
Bishop's University	Sherbrooke	No transportation offerings reported
Concordia University	**Montreal**	**Aviation M.B.A. reported; see text. A Transportation Option M.B.A. is indicated on website but no longer exists. Civil Engineering offers transportation option.**
École des Hautes Études Commerciales	**Montreal**	**No transportation program offered; associated with the CRT (see text).**
École Polytechnique de Montréal	**Montreal**	**Transportation Engineering program. See text.**
Université Laval	Quebec	Although individual courses in transportation are offered, there is no program.
McGill University	**Montreal**	**Civil Engineering offers a Transportation Specialization. See text.** **Economics offers a Transport course but does not have anyone to teach it.** **Faculty of Management offers a single Logistics Course. Approximately 25 student take Logistics Management. It is a graduate level course open to our M.B.A. and Master of Manufacturing Management students.** **Department of Career and Management Studies offers an extensive Certificate in Transportation program. Enrolment data were not available but we were told that "It is pretty popular."**
Université de Montréal	**Montreal**	**Centre de recherche sur les transports; see text.**
Université du Québec	Sainte-Foy	Reported that no transportation programs are offered.
Université du Québec en Abitibi-Témiscamingue	Rouyn-Noranda	Reported that no transportation programs are offered.

École nationale d'administration publique	Sainte-Foy	no transportation programs reported
Université du Québec à Chicoutimi	Chicoutimi	no transportation programs reported
Université du Québec à Hull	Hull	no transportation programs reported
Université du Québec à Montréal	**Montreal**	**Faculty of Administration offers undergraduate, graduate and certificate programs. See text.**
Institut national de la recherche scientifique	Sainte-Foy	
Université du Québec à Rimouski	**Rimouski**	**The University of Rimouski offers 4 courses in maritime transportation within its graduate program in management of marine resources. Transportation is one of the three options in the marine M.Sc. program. The courses include:** **GRM73595 Transport maritime** **GRM74592 Gestion portuaire** **GRM75599 Droit du transport et de l'assurance maritime** **GRM76599 Gestion d'une flotte commerciale** **UQAR cooperates with the local Cégep and its Institut maritime du Québec.**
Université du Québec à Trois-Rivières	Trois-Rivieres	Reported that no transportation programs are offered.
École de technologie supérieure	Montreal	No transportation programs reported
Télé-université	Sainte-Foy	Not included in survey.
Université de Sherbrooke	Sherbrooke	Reported that no transportation programs are offered.
SASKATCHEWAN		
The University of Regina	**Regina**	**No courses in transportation are offered by the Economics Department or the Faculty of Administration.** **Regina's Civil Engineering transportation offering has faded; see text.**
Campion College	Regina	Reported that no transportation programs are offered.
Luther College	Regina	Not included in survey.
Saskatchewan Indian Federated College	Regina	Not included in survey.
University of Saskatchewan	**Saskatoon**	**Civil Engineering maintains a transportation program; see text. A transportation course is offered by Agricultural Economics (845, Transportation Economics and Policy) and the Department indicated that it is attempting to increase the visibility of transportation.** **The Transportation Centre is housed in the Civil Engineering Department and is active in the area of vehicle safety–the program is funded by Transport Canada.**

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UNIVERSITY TRANSPORTATION EDUCATION PROGRAMS: SOCIAL SCIENCES, BUSINESS AND INTERDISCIPLINARY

Very few comprehensive university transportation programs, other than those associated with civil engineering departments and strongly focussed on roads and motor vehicle traffic,[23] were identified. Further, even the few described here were perceived to be struggling for success (if not survival) in the Canadian universities environment of 2000. It should be noted, however, that less formal transportation educational activity associated with university transportation centres (as opposed to formal programs in the faculties and departments) has already been discussed above.

University of British Columbia

University of British Columbia (UBC) offers a B.Com. degree in *Transportation and Logistics* (TLOG), an M.B.A. in *Supply Chain Management*, with more specialized research programs leading to the M.Sc. (Bus. Admin.) in *Transportation and Logistics*, as well as a cross-field Ph.D. combining transportation and/or logistics with recognized disciplines such as economics or management science. The Commerce faculty's programs are well established, and its graduates are well known and have generally done well in the industry. UBC has a long history of interest in transportation studies. In the 1920s, when UBC was just formed, one of the first courses in economics and commercial studies was on transportation and public utilities. These studies continued as part of the Department of Economics. The Faculty of Commerce and Business Administration was formed in about 1956. *Transportation and Utilities* was one of the original major fields of study in the Faculty. B.Com.'s have graduated with a transportation major since that time. The M.B.A. degree was introduced in the early 1960s and transportation was one of the available majors from the beginning.

The program emphasis has undergone periodic change over the years. The attention to public utilities and regulation faded during the 1970s and was replaced by greater emphasis on management and logistics. The first logistics course in Canada was introduced at UBC in the1960s. An M.Sc. (Bus. Admin.) was introduced in the 1970s. This enabled a stronger graduate research degree while allowing the M.B.A. degree to have a more managerial orientation. A Ph.D. program was also introduced in Commerce in the 1970s. By design, a Ph.D. in transportation *per se* has never been offered. In about 1985, the Division name was formally changed to *Transportation and Logistics* to better reflect the content and orientation of the program.

An entirely new M.B.A. program was introduced in1996 with a new philosophy and radically different program design. One of the majors in the new program is Supply Chain Management. The most recent program innovation is the undergraduate co-op program, introduced early in 1999.

All of the programs are full time. The Commerce faculty has very few part-time students. Currently, the B.Com. TLOG program has 16 students in 4th year and 25 majors in their 3rd year. This includes 11 students in the co-op program. Enrollment in individual classes is larger than the number of majors. The air transportation course typically has 40-50 students. The introductory course in Operations and Logistics is multi-section with about 240 students in total. It has become quite popular and fills up several weeks before the term begins.

Currently there are three M.Sc. students in TLOG. Also, some of the M.Sc. students in management science and operations are working on supply chain topics. There are four students graduating in the *Supply Chain Management major* in the M.B.A. program, and 10 of the incoming 100 M.B.A. students

are taking the SCM option. Enrollment in the M.B.A. supply chain courses typically is around 30-40, but most of the students are majoring in another area such as information systems, marketing or finance.

UBC. has graduated B.Com.'s with a transportation major since the late 1950s. Graduates from 1985 were:

1985	12	1993	18
1986	15	1994	17
1987	31	1995	18
1988	35	1996	16
1989	22	1997	18
1990[24]	58	1998	7
1991	26	1999	8
1992	22		

Enrollment fell off in the late 1990s due to a combination of a poor local job market and the introduction of a "General Business" program which no longer required students to identify a major in order to receive the B.Com. degree. However, the number in the TLOG program is now increasing following the revisions to place greater emphasis on operations and supply chain management. Two co-op plus 14 regular students are scheduled to graduate in 2000, with 9 co-op and 16 regular in 2001

M.B.A. students have graduated in TLOG since the early 1960s and M.Sc. students since the early 1970s. In 1996, UBC completely changed the M.B.A. program and introduced a *supply chain management* (SCM) specialization. The courses have proven very popular as electives (class size 30-40). The number of graduates with SCM specialization was about 4 in the first two years of the new program. Ten students (about 10 percent of the M.B.A. population) have declared SCM majors in the incoming M.B.A. class. Due to funding limitations, UBC does not emphasize the M.Sc. program and some of the specialized courses are no longer offered. One M.Sc. graduated last year; four are currently enrolled. About one Ph.D. graduates per year. There was no graduate in 1999 but two (of the four currently enrolled) are reported to be in the advanced dissertation stage.

A number of scholarships and bursaries are available to students. Most recently, the Purchasing Management Association is awarding two $2500 scholarships to undergraduate students planning to pursue a career in supply chain. Other awards include air ticket awards by both Air Canada and Canadian Airlines International. At the graduate level, a CN Fellowship is provided from an endowment given by CN, and UPS foundation income is often used to help support graduate students. Graduate and undergraduate students work as research assistants on projects. About six to eight are employed at any one time. The research is funded primarily by granting agencies.

UBC is a provincial university and largely dependent on tuition and provincial grants to cover the teaching programs. However, UBC has been under a tuition freeze for a few years and this has steadily eroded funding available to teaching programs. This has placed greater pressure for large class sizes. We were told that, because transportation does not have the same level of awareness and popularity as accounting and other traditional fields, it is increasingly difficult to defend offering more specialized courses. The Commerce faculty has been able to continue offering the TLOG program but cancels one or two courses each year. We were also told that UBC is having continuing difficulty in attracting and holding faculty as its salaries are not competitive with other top

universities. The above is illustrated by the list of courses that follows.

As of the end of 1999, there are three full time faculty[25] teaching in transportation and logistics (a serious reduction from five a few years ago). These have been merged with *Management Science* to for the *Operations and Logistics Group*. Thus, the listing below includes several faculty who teach closely-related supply chain courses.[26] There are also visiting faculty.[27]

Transportation and Logistics Courses and Instructors, 1999-2000[28]

Undergraduate

C399 Introduction to Operations and Logistics (4 sections)	Lawson, Haughton
C349 Logistics Services Management	Henriksson
C441 Applied Business Logistics	Chow
C449 Supply Chain Management	Chow
C444 Air Transportation	Tretheway
C445 Shipping and International Logistics	*not offered*
C394 Government and Business (TLOG section)	Henriksson
C447 Project Evaluation and Management	Waters
E480 Economics of Transportation	Waters

Graduate Courses

M.B.A. Supply Chain Courses (½ courses, 20 hour modules)

BATL 510 Intro to Logistics and Operations Mgmt.	Lawson
BATL 511 Logistics and Operations Systems Design	Haughton
BATL 580 Current Issues in Logistics and Operations Mgmt.	Lawson
BAMS 510 Planning and Scheduling for Operations and Logistics	Queyranne
BAMS 514 Supply Chain Management	Christopher
BAMS 515 Total Quality Management	Queyranne
BATL 590 Directed Studies (individual student direction)	Waters (shipping)
BAPA 503 Cost Benefit Analysis	(Waters) *not offered*
BAPA 504 Public Project Evaluation Methods	(Waters) *not offered*

M.B.A. TLOG Modules which are authorized but have not been taught

BATL 500 Transportation Services Management
BATL 501 Transportation Policy
BATL 502 Applied Demand Analysis
BATL 503 Cost and Productivity Analysis
BATL 504 Service Pricing and Revenue Yield Mgmt.
BATL 505 Airline Industry Mgmt. And Policy
BATL 520 Project Management
BATL 521 Management of Infrastructure

M.Sc. and Ph.D. courses

C544 Seminar in Transportation and Logistics	*not offered*
C545 Seminar in Transport Economics	*not offered*
C643 Research Workshop in Transport and Logistics	*not offered*[22]
C644 Ph.D. Seminar in Transport Economics	Oum & Waters

A UPS Foundation grant supports one full time transportation and logistics chair and provides a "top up" for a second chair. This support is, in our view, very important to the continuance of the UBC transportation programs with their relatively conceptual academic emphasis–where some other university transportation programs have been discontinued or modified to meet industry's immediate needs for more basic skills.

The UBC Commerce faculty does not emphasize non-degree courses or programs. There are occasional short courses and special purpose training for visiting students arranged through CIDA or similar programs. There are also Executive Programs which include courses on logistics and inventory management. In 2000, UBC. will be running a two day *Supply Chain Management* program. The Faculty has a number of executive and training programs for China and Korea; some of these involve transportation topics. Most of the TLOG faculty have taught short courses in Canada and overseas.

We were told that a re-vitalized M.Sc. program will be advanced over the next 18 months. The UBC. transportation faculty concerned see expansion of the M.Sc. program as their highest priority. They have identified a national and international demand for expertise in transportation policy, project evaluation, economic analysis of demand and costs, etc., combined with some logistics and operations studies. However, it was noted that expanding the M.Sc. program faces special obstacles because of the tuition freeze and inadequate funding to mount the courses to provide the analytical foundation for the M.Sc. program. Although existing courses can be used for most of their program, a need for foundation analytical courses in transportation is seen. This would replace the present approach of teaching students via directed studies courses.

To the above end, four initiatives are envisaged: (1) recruiting some overseas students who pay higher tuition; (2) attracting additional scholarship awards to increase the number of students in the program; (3) attracting some funds to underwrite a couple of courses which can be offered even if the enrollment levels are smaller than for the finance and other popular courses which attract the majority of students; (4) attracting additional faculty interest in the transportation field to supplement the number of faculty and courses which are available to the students.

Some relevant comments provided by UBC but not covered above are included as Appendix C.

University of New Brunswick

The UNB Transportation Group is responsible for several interlocking graduate programs in transportation. The M.Sc.E. and Ph.D. programs are essentially interdisciplinary (and thus would fit in the present category); however, the M.Eng. program is much closer to civil engineering. And, the Group is associated with UNB'S Department of Civil Engineering. To avoid splitting the discussion of the UNB programs, they are discussed as *Civil Engineering Transportation Programs* below.

We also note here that we were told of a new M.B.A. at UNB with a specialization in transportation,

and that this specialization would be noted on the degree. It is not clear when the first class in this program will be enrolled.

Université du Québec à Montréal (UQAM)[30]

The Faculty of Administration at UQAM first offered a few courses oriented towards the road transportation industry in the early 1990's. These courses were initiated at the request of the trucking industry in Québec and especially in response to a request from the *Fondation pour la formation professionnelle en transport routier de marchandises du Québec*. This "Fondation" is sponsored by trucking companies and suppliers. The *Fondation pour la formation professionnelle* donated $50,000 towards the development of course materials for a diploma program with a specialization in trucking. As of 2000, UQAM offers four identifiable trucking oriented programs.

Bachelor of Administration

Since 1995, the Université du Québec (UQAM) has offered a Bachelor's degree in administration (B.A.A.) with a specialization in transportation and logistics. This program is of special interest because it has a modal focus–trucking. The B.A.A. is 90 credits in total, which amounts to 30 one-semester courses over a three-year program for full-time students. The faculty can have up to 350 first-year students. Transport and logistics is under a profile called Operations Management. As well as the more general mandatory and optional courses taken during the first two years, all students registered for a B.A.A. choose a specialization or *profile*. Transport and logistics is one of those specializations. The transportation courses are taken in the third year.[31]

Under that profile, UQAM now offers 7 courses focussed on logistics and road transport. One of these courses is mandatory for all the students registered in Operations Management and 6 other courses are offered for those students wishing to specialize in logistics and transport. To complete this profile, a student must complete 5 courses or 15 credits. This would be equivalent to a full semester for a full time student. The courses offered are:

All of	Logistics
	Operations management and decision technology for road transport
	Productivity and quality in road transport
	Costing for road transport
One *of*	Planning methodologies in transport
	Analysis of the legal and economic framework for road transport
	Transportation legislation

The program is now producing 15 to 20 graduates each year.[32] So far, the students have found employment in the sector. The "Fondation pour la formation professionnelle en transport routier de marchandises du Québec" issues a certificate to all graduates in recognition of their area of specialization.

Diploma in Business Administration

UQAM also offers a certificate (diploma) in Business Administration. All courses are delivered during

the university's normal daytime schedule. Within this certificate program students may follow a *Transport and Logistics* option (specialization). Diploma students must complete 10 courses or 30 credits. Of these, UQAM requires 5 courses in transport/logistics for the *Transport and Logistics* option certificate as follows:

All of
- Logistics (also required by students pursuing the *Operations* option)
- Operations management and decision technology for road transport
- Productivity and quality in road transport
- Costing for road transport

One *of*
- Planning methodologies in transport
- Analysis of the legal and economic framework for road transport
- Transportation legislation (a Law course)

Also, among basis courses, transportation students would presumably take
- Transport services marketing

The majority of students registered for the Certificate are people already working and attending University on a part-time basis. For 1999-2000, eight of the students registered for the Certificate are pursuing the transport and logistics option. In the past, there have been as many as 25 students interested in the transport specialization.

Short Program in Road Freight Transport Management

UQAM is offering, on a trial basis (two classes of students) an 18 credit (six courses of 45 hours) short program dedicated to management of the road transport of freight. Classes are limited to a maximum of 35 students with a lower limit of 25. Students must be at least 21 years of age, have gained practical knowledge in the management of various aspects of a trucking operation, and have a minimum of two years of experience in the trucking industry. In addition to competency in French, a working knowledge of English is required.

Participants attend every Tuesday for intensive instruction in:

- Transport services marketing
- Operations management and decision technology for road transport
- Productivity and quality in road transport
- Logistics
- Costing for road transport
- Analysis of the legal and economic framework for road transport

Executive M.B.A.[33]

As of January 2000, UQAM has been offering experienced professionals a part-time M.B.A. with a

specialization in transportation and logistics. The program is designed for people already in the workforce. It considers all modes of freight transport. Entrance requirements are a bachelor's degree plus four years of pertinent professional work experience or seven years of pertinent professional work experience. Students attend for three days (Friday, Saturday and Sunday) one weekend per month. Two 3-credit courses (22 ½ hours per course) are taken at one time. Fees are $250 to $300 per course. To graduate, the student must complete a total of 45 credits (15 courses) in not less than two and not over four years. The course titles roughly translate as:

The individual and the organization in logistics and transportation
Statistics and decision theory in logistics and transportation
Data and information technology in logistics and transportation
The economic environment in logistics and transportation
Accounting systems in logistics and transportation
Financial management in logistics and transportation
Marketing in logistics and transportation
Introduction to logistics
Transport operations
Productivity and quality management
The economic and socio-political context of logistics and transportation
Strategic management of the supply chain
Strategic analysis of distribution networks
International project in logistics and transportation
Logistics in the international context

General Assessment

There are 3 full-time transportation professors at UQAM, plus one part-time professor (and resource persons from industry). To personally instruct all of the courses of each of the above programs would–at least on the surface–seem too much for such a small faculty contingent specializing in transportation (even though the individuals concerned are energetic and are known to be strong academics); however, three factors should be noted in this respect. First, the proportion of *logistics* relative to *transport* is fairly high. Second, many of the courses on the programs–especially the Executive M.B.A.–are offered in the transport and logistics context but are not themselves inherently logistics or transportation. Presumably these are taught by other than the above faculty members. Third, although the classes for the different programs may be separate, the course material is often the same or very similar–allowing economies of preparation. Regardless, the load on 3 ½ persons seems very high, and we are told that–in the future–UQAM is also planning to launch a program focussing on passenger transportation.

The UQAM programs are all very new, and it is encouraging to see such initiatives come to fruition. Yet, falling enrollment in some of the programs is a concern, and it remains to be seen whether there is a steady-state demand (after an initial bulge consisting of students who would have taken the programs in earlier years–had the opportunity been available) to justify the long term maintenance and growth of these programs.

Others

Beyond what we consider to be full programs in transportation, there are other situations, not mentioned under *Formal University Transportation Centres and Institutes* above that will lend some

insight to the overall question of professional transportation education in Canada.

Concordia

The Concordia Faculty of Commerce and Administration started B.Com. and M.B.A. programs with a concentration in transportation in the early 1980s. The intention was to appeal to Montreal's large community of transportation company employees. Application to join the TUP was rejected. We understand that these programs were successful until about the class of 1989, when a sharp decline in student numbers occurred. This was attributed to a lack of job opportunities. We are uncertain as to the timing or their demise but we understand that, as of 1999, the programs no longer exist[34] – although publicity for them persists.

An *International Aviation* M.B.A. was initiated in 1991. The publicity for it indicates IATA sponsorship but we were unable to get information on the extent of this sponsorship, and whether it is financial. Courses include:

AMBA 635	Air Transportation Economics and Finance
AMBA 637	Airline Marketing
AMBA 644	Airline Operations
AMBA 645	Aeropolitical and Legal Environments
AMBA 646	Seminar in Contemporary Airline and Aviation Management
AMBA 647	Airport Operations

We were unable to determine whether/when each of these courses is offered.[35] In addition to the courses, we were told that International Aviation M.B.A. students take other courses from the regular M.B.A. program and are expected to do a research project and complete an internship in air.

An official of the Faculty told us that there were approximately 30 students in each class of the program; however, a professor contacted suggested 6 or 7. The confusion may relate to full time versus part time students, or to the capacity of the program versus actual registrations/graduations.

We note that Concordia offers a seminar in Supply Chain Management with sessions on transportation and logistics through its Executive Development Program as well as two twenty-hour courses in basic transportation as part of its Continuing Education program in Purchasing and Inventory Control.

Concordia's engineering faculty offers a transportation *program* (discussed briefly below); however, there appears to be absolutely no interaction between this and the Commerce offerings.

University of Toronto

University of Toronto's Rotman School of Management has offered some transportation-related courses and seminars. Although no current program in transportation at Rotman was indicated, we note that the School has received a one million-dollar ($1 million) endowment for a Chair in Strategic Management from Canadian National. We were informed that the School has made academic appointments of staff with significant interest in transportation and logistics issues. Yet, it appears that substantial grants of money from transportation firms does not necessarily result in enhanced transportation education.

As an example of a program that falls close to the line of qualifying as non-technological professional

transport education–but, in our judgement, just outside of it–the UofT Institute for Aerospace Studies offers a *Professional Pilot and Aviation Management Program*. The program is designed for individuals seeking a career in flight operations and is limited to students with an undergraduate degree in engineering or an equivalent academic program. Approved flight school trainees may also take this 8-month program with an academic fee of $18,000 (as of November 1999). The curriculum includes: flight mechanics, aerodynamics, management strategies, tools and skills, avionics and automated systems, air law, project management, financial management and accounting, and information technology in aviation.

McGill Certificate in Transportation

McGill's Department of Career and Management Studies (continuing education) offers an extensive undergraduate Certificate in Transportation program. The program is designed to provide an academic basis for management positions in transportation and is open to CEGEP graduates or mature students.

The following are required courses for the Certificate in Transportation:

Effective Communications
College Algebra.
Managerial Economics
Business Law
Marketing Management
Introduction to Financial Accounting
Physical Distribution
Transportation Economics
Transportation Law and Regulation
Transportation Policy.

In addition, two further courses must be taken from a selection of modal courses (two each in Air, Road, Rail, Marine, or Urban Transportation) and general business courses (Business Law II, Macroeconomic Policy, Marketing Management II, Management Statistics, or Operations Research).

Students entering the Certificate Program are encouraged to have taken CITT Distribution I and II courses (or their equivalent) prior to entry. Many of the courses offered for the Certificate in Transportation Program may also be offered towards the CITT designation.

The Certificate Program has been offered for many years and we were told that "it is pretty popular" although no numbers of participants were available.

McGill also offers a range of short courses and workshops, some of which have been related to transportation. Of the current offerings, the only relevant one is a seminar on *Managing the Supply Chain* offered through the Executive Institute. This workshop is designed for newcomers to logistics who want an expert, up-to-date briefing in the subject, logistics professionals looking for information on current practice, IT professionals who require an understanding of the relationship between logistics and information technology, and operations managers who must understand the implications logistics has on manufacturing decisions.

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[23] See the following chapter.

[24] There were two classes in 1990 due to the shift from a 5-year to a 4-year program.

[25] Garland Chow, Tae Oum and William Waters each have extensive credentials and experience, and international reputations. Trevor Heaver is an Emeritus Professor, no longer teaching, but he is involved in research activities. Michael Tretheway, formerly a full-time faculty member, continues as an Adjunct Professor. He is teaching the Air Transportation course in Spring, 2000.

[26] Faculty teaching related to logistics and supply chain topics include: Maurice Queyranne; Operations management, inventory management, planning and scheduling; Marty Puterman, Operations management, operations research, Director of the Centre for Operations Excellence (COE); Derek Atkins (on administrative leave as an acting Vice President of UBC), Supply chain management; Shelby Brumelle, Queueing theory, simulation, optimization.

[27] Visiting faculty teaching in the TLOG and SCM programs include: David Lawson, Ph.D., on leave from Hewlett Packard in California, teaching operations and logistics courses; research on supply chain management; Michael Haughton, Ph.D., visiting from the University of Jamaica, teaching operations and logistics including M.B.A. courses; visitor in 1998-9 and 2000-2001; Martin Christopher, Ph.D. from University of Cranfield, UK, visiting Spring 2000.

[28] Professor Tae Oum is on sabbatical, at Nanjing University, Singapore; Trevor Heaver is Visiting Professor at the University of Sydney.

[29] Replaced with workshop on Operations and Logistics

[30] This information was obtained through an in-person interview with Jacques Roy, Professor at UQAM and in charge of their transport/logistics program, from the internet, and from UQAM's information brochures on their courses and diplomas.

[31] We were told that students do not enter the B.A.A. program with a transportation specialization in mind. It is necessary to sell transportation to the students during the initial two years.

[32] A total of approximately 80 students take the logistics course.

[33] UQAM also offers a full time M.B.A. Students within this program may pursue transportation interests and write a transportation thesis; however, the program does not have a formal transportation specialization–as would qualify for this inventory.

[34] No transportation or logistics courses are listed in the 1999-2000 calendar.

[35] All are listed in the course schedule for 1999-2000, but no times, dates or locations are indicated and the instructor for each course is shown as "TBA".

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CIVIL ENGINEERING TRANSPORTATION PROGRAMS

Almost all civil engineering programs include some transportation beyond pure infrastructure design (which is outside of the scope of this inventory). Thus, one would normally expect to find one or two undergraduate courses in transportation and a few graduate courses and students specializing in transportation within any civil department. It is NOT intended to report all such instances here; however, we feel that we must discuss some civil engineering transportation programs for at least two reasons.

> First, some programs that have developed in civil engineering departments are more comprehensive than the norm and have extended substantially into interdisciplinary transportation teaching or even transportation economics.
>
> Second, there is the question of whether–as we were told by some we consulted during the course of this study–civil engineering is generally being relatively well looked after while it is the management and economics programs that are suffering.

Thus, the civil transport programs that are discussed below are included for one of the above reasons. Either they stand out because of the extent of their transportation offerings, or we have some particular information that will allow comment on changes over time. This especially applies to programs that were active under the former Transport University Programs (TUP). We further note that the inclusion/exclusion choice was difficult.

University of New Brunswick

As noted above, the Transportation Group at the University of New Brunswick is included in the Department of Civil Engineering. Its programs extend substantially beyond the scope of civil engineering;[36] however, the Group's core competence is in the civil area. The Transportation Group was founded in 1968 and its programs are multi-disciplinary and multi-modal. The stated objective is the production of well-rounded transportation professionals with a *"focus on education rather than training, the latter being the responsibility of the industry sector which employs* [their] *graduates"*.

Graduate programs are available leading to the degrees of Master of Science in Engineering (M.Sc.E.), Master of Engineering (M.Eng.), and Doctor of Philosophy (Ph.D.). There is also a Diploma program for practising transportation specialists. It allows for their participation in transportation courses, even though they might not meet the entrance requirement for graduate study at UNB. The Diploma may be taken through two terms of full-time study or it can be pursued on a part-time basis.

There are also undergraduate transportation courses within the Civil Engineering Department. These are roads and infrastructure design and traffic engineering oriented, and the interdisciplinary and intermodal breadth of the graduate programs do not apply. There is no formal undergraduate transportation specialization within UNB's civil program. Still, opportunities for transportation engineering specialization are at least the equal of those in some universities with a designated formal specialization.

Civil Engineering undergraduate transportation courses offered by the Transportation Group include:

Undergraduate[37]

- CE 3201 Introduction to Transportation Engineering
- CE 5201 Road Materials and Structures
- CE 5212 Pavement Design 1
- CE 5222 Traffic Engineering
- CE 5232 Transport Facility Design
- CE 5241 Introduction to Pavement Management Systems

Graduate

- CE 6204 Transport Data Analysis *[offered winter 1999]*
- CE 6205 Transport Networks *[offered autumn 1999]*
- CE 6214 Transport Simulation *[offered winter 1999]*
- CE 6215 GIS-T [geographic info syst] *[offered winter 2000]*
- CE 6222 Traffic Engineering *[offered autumn 1999]*
- CE 6232 Transport Facility Design *[offered winter 2000]*
- CE 6233 Transportation Systems Planning II *[offered winter 1998]*
- CE 6244 Transportation Logistics and Physical Distribution *[offered winter 1998]*
- CE 6245 Transportation Operations *[offered autumn 1997]*
- CE 6253 Physical Distribution and Transportation *[offered winter 2000]*
- CE 6263 Aviation and Airport Planning and Design *[offered winter 1999]*
- CE 6273 Transportation Management* *[offered winter 2000]*
- CE 6283 Transportation Policy *[offered autumn 1998]*
- CE 6292 Transportation Seminar* *[offered winter 1999]*
- CE 6303 Urban Planning *[offered autumn 1999]*
- CE 6313 Regional Planning *[offered winter 2000]*
- CE 6323 Ports and Shipping: Policy and Planning *[offered autumn 1999]*
- CE 6353 Public Works Administration *[offered winter 1997]*
- CE 69xy Special Studies *[ongoing]*
- ECON 6803 Transportation Problems and Policies *[offered autumn 1999]*

** These courses are prescribed as core courses and must be completed by all transportation graduate students.*

The graduate course offerings are intended to provide the student with flexibility in tailoring his or her program of studies. Programs are intended to be as broadly based as possible with opportunities for interdisciplinary problem solving. Students are encouraged to pursue courses in other transportation related disciplines. While the program is based in the Department of Civil Engineering, we were told that students from a variety of backgrounds regularly enroll and succeed in the program. Students with backgrounds in Economics, Business, Commerce, Statistics, Planning, Geography and Mathematics have successfully completed the program. Depending on the background of the student, some undergraduate courses may be included in the program for background.

It is the M.Sc.E. program (which can be completed within a two year period) that has the intermodal and interdisciplinary content. The M.Eng. option is closer to the traditional civil engineering approach to transport. Between 1990 and 1998, a total of 25 degrees were awarded–an average of three annually. These consisted of three Ph.D. degrees, 17 M.Sc.E. degrees (an average of two annually) and 5 M.Eng. degrees. During the same period, a total of 2 diplomas were awarded. Currently, there are 19 graduate students comprising two Ph.D. candidates, 11 M.Sc.E. candidates, and 6 M.Eng.

The Transportation Group also organizes and delivers continuing education workshops for transportation practitioners. These will increase in importance for members of the Association of Professional Engineers of New Brunswick for which they qualify as *continuing education units* under the emerging *Continuing Competency Assurance Program.*[38]

In our view, the strength of the UNB Transportation Group is its full time and *emeritus* faculty. While, for budgetary reasons, some other university transportation programs have had to depend on *adjunct* faculty members, the UNB Group's full time complement of eight faculty members includes three full professors, two associate professors, two assistant professors and a postdoctoral fellow–an unusually good balance in a Canadian university in 1999. In addition to the eight (one of whom–a former Coordinator of the Transportation Group–occupies a funded Chair, and one who is serving as UNB's Assistant Vice President Academic), the Group enjoys the active participation of two *emeritus* professors[39] (one a former Dean and Vice President of the university) and an economics professor (formerly Chair of the Economics Department) who dedicates a great deal of his time to the Group.

There is, in our view, no substitute for a long established status and credibility within the university hierarchy and the local transportation industry. The UNB Transportation Group would seem to enjoy both. We understand that the Group has its own dedicated micro-computer laboratory equipped with up-to-date facilities and a wide range of current software, including various transportation related software packages, and that the Engineering Library contains a wide range of transportation related journals, textbooks, reports and papers–a collection that was established over more than three decades. The Group also maintains close liaison with the transportation community. *Inter alia* this has led to government and private sector provided excellent student projects. It also leads to suitable employment for graduates. We were told that all 1999 graduates are employed in transportation.

École Polytechnique

The transportation programs at École Polytechnique are essentially those prevailing in a typical Canadian civil engineering department. Transportation as an option within the civil engineering discipline of what is now École Polytechnique's Civil, Geology and Mining Department[40] dates from 1969 when two professors were appointed. École Polytechnique's Transportation Section expanded to 5 faculty members in the 1980 to 1985 period. It has since shrunk back to two, Professors Robert Chapleau (urban transport and transit planning) and Karsten Baass (roads and traffic).[41] Both professors have teaching responsibilities that extend beyond the Transportation Section. The principal foci of the École Polytechnique programs are roads design, traffic management and urban transit.

Associated with École Polytechnique's Transportation Section, Groupe Madituc (Modèle d'Analyse Désagrégée des Itinéraires de Transport Urbain Collectif), under the leadership of Dr Chapleau, conducts contract and grant funded research ($500,000 annually was indicated). In addition to student participation, four professional research associates are employed. One of these gives ½ of an undergraduate course. Important sources of project funding include the Quebec Ministry of Transport, the Montreal Urban Community and the Montreal Urban Transit Commission. The Toronto Transit Commission, Winnipeg Transit Department, Montreal South Shore Transit Commission, City of Laval Transit Commission and Quebec Urban Transit Commission are also mentioned on the Madituc website. Student support from NSERC and FCAR was also noted.

École Polytechnique offers two Masters degree options–a research Masters that includes a thesis, and a courses option that includes a project report. We were told that, on average, five to six transportation students would be enrolled for the research degree with approximately ten in the courses option. Exact current numbers did not appear to be readily available. École Polytechnique reported two civil engineering doctoral students specializing in transportation as of November 1999. One can project approximately eight graduates annually. Many of the graduate students come on scholarship from francophone Africa, particularly Senegal, Morocco and Tunisia; however, these numbers are falling with reduced funding available.

Graduate students without undergraduate degrees in civil engineering are accepted into École Polytechnique's transportation programs. Typically, these students have degrees in geography or management. Some graduate students, particularly from France, come only for the summer semester.

Graduate course titles and offer date indications from the timetable are:

Planification des transports	*[cancelled]*
Analyse des transports	*[offered autumn 1999]*
Recherche operationnelle en transport	
Theorie de la circulation	
Dynamique de la circulation	*[offered autumn 1999]*
Technologie des transports	
Transport en commun	*[offered 2000-2001]*
Capacité des élèments routiers	*[offered 2000-2001]*
Géométrie des tracés	*[not offered]*
Conception et entretien des chaussees pour routes et aéroports	*[not offered]*
Matériaux routiers	*[not offered]*

We were informed that the last two courses would not be offered this year. Further, we note from the internet guide for students that only two–Dynamique de la circulation and Analyse des transports–are being offered in the autumn of 1999. The École Polytechnique's course calendar indicated that Planification des transports was also to be offered in this semester but it has presumably been cancelled. According to the calendar, a further three of the transport courses will be offered in the winter term with two courses not offered in 1999-2000 but planned for 2000-2001. It indicates that the final three courses in the above list are not expected to be offered within the next three years.

All undergraduate civil engineering students take two compulsory courses in transportation:

- *Systems de transport* (transportation systems)–Dr Chapleau
- *Conception des routes* (principles for roads)–Dr Baass

In addition, École Polytechnique undergraduate students enrolled in Civil have certain options, including their research project. We were told that, in a normal year, approximately 20 of a Civil class of approximately 120 concentrated on transportation. We were also told that, of the class entering second year in September 1999, only 30 enrolled in Civil. This is attributed to the dearth of construction activity in Quebec and it was noted that the École Polytechnique undergraduate civil students are local francophones who characteristically seek to obtain employment inside of Quebec.

Non-degree courses in transportation are not offered by École Polytechnique per se; however, Dr Baass mounts intensive courses for the MTQ. There are also a number of students–mostly consulting firm personnel–who come for single graduate courses with no intention of completing a degree.

University of Calgary

The University of Calgary's Department of Civil Engineering has long established (since 1971) roads-focussed transportation programs with a *minor in transportation* at the undergraduate level, and Masters and Ph.D. programs. The Department is closely affiliated with *Centre for Transportation Engineering and Planning*, a membership organization, and the Department's internet site also mentions the *Transportation Theme School* sponsored by the Van Horne Institute (as discussed above) that leads to an interdisciplinary minor.

All 3rd year civil engineering students are obligated to take:

- Introduction to Transportation Planning[42]

In addition, students pursuing a transportation minor are also required to take five additional roads and traffic engineering courses:

	Students 1999-2000
Highway Engineering	35-40
Traffic Engineering and Operations	30-35
Modelling of Transportation Systems	approximately 15
Asphalt Pavement Design and Management	approximately 20
Independent Research in Transportation Issues	10-12

Transportation courses at the graduate level offered within the Department of Civil Engineering, include:

	last offered
Traffic Systems	Not recent
Transportation in the Urban Environment	Fall 1999
Urban Transit Planning	1997
Urban and Regional Transportation Planning	1997
Traffic Engineering Winter	2000
Theory of Transport Demand Modelling	Fall 1999
Public Transit Systems	probably 1998
Mountain Highway Engineering	Fall 1999

Transport Economics	Winter 2000
Transport and Land Use Interaction Analysis	Reading course 1999-2000
Intelligent Transportation Systems[43]	Fall 1999

There are five faculty members in the Transportation Group, three of them at the full Professor level.

Some 10 to 12 undergraduate students elect (in 3rd year) the transportation minor. As of January 2000, there are 4 Ph.D. students and 4 M.Sc. students–all full time. In addition, there are 20 part time M.Eng. students. On average, one Ph.D. (This year there are two) and three M.Sc. graduate, as well as 2-3 M.Eng. Since 1971, 122 graduate degrees have been awarded

In addition to its intramural programs, the Department effectively manages the education program of the *Centre for Transportation Engineering and Planning* (C-TEP), and one of its senior Professors acts as the Centre's Executive Director. In addition to its research role, C-TEP has a continuing education role, mounting seminars and short courses for practitioners. At least some of these satisfy continuing professional development requirements of the Alberta professional engineers association. Topics include:

- Bridge Inspection
- Road Safety Audits
- Pavement Design
- Traffic Management
- River Hydraulics Modelling
- Highway Design
- Temporary Traffic Control for Work Zones *(new course)*

C-TEP courses are taught by U of Calgary academics, faculty from other universities and practising professionals.

University of Toronto

The University of Toronto (U of T) offers transportation courses within a number of different sectors of the University but UofT's most active transportation teaching is within Civil Engineering.

The undergraduate program includes what is approximately the general civil engineering transport offering:

Transport 1, Design	*2nd year*
Transport 2	*3rd year*
Transport 3, Planning	*elective*
Traffic Engineering	*elective*

It is difficult to provide a count of undergraduate students in transportation since there is no specific area of specialization. We were told, however, that interest in transportation seems to be at an all-

time high (at least since 1983). Approximately 30 percent (25 students) of the 4th year class doing transportation-related theses during the 1999-2000 academic year. Fifty-nine students are enrolled in the 4th year urban transportation planning course (Transport 3). This is the highest enrollment in these courses as far as can be remembered.

The graduate transportation program is apparently quite comprehensive. Ten specific courses are listed in the calender (although not all are offered–at least not every year):

- CIV 530 Traffic Engineering
- CIV 531 Transport III - Planning
- CIV 1502 Road Safety
- CIV 1503 Transportation Systems Performance
- CIV 1505 Transportation Research Seminar
- CIV 1506 Stochastic Aspects of Transportation
- CIV 1507 Public Transport
- CIV 1508 Airport Planning and Engineering
- CIV 1535 Transportation and Development
- CIV 1538 Transportation Demand Analysis.

There are twenty full-time graduate students in Transportation (twelve at the Ph.D. level). Graduate enrollment has traditionally been in the range of fifteen students with only a handful at the Ph.D. level.

Transportation faculty includes four full time faculty members (one of whom is on leave and may retire), an *emeritus* professor who continues to teach a course, and three adjunct faculty. The department has an active research group with the four full-time and two *emeritus* professors (who are also active researchers). Major research funding has come from the Ontario Ministry of Transportation, various regional municipalities in the Greater Toronto Area, NSERC, and the GEOIDE Network of Centres of Excellence. Other project research funding has been obtained from the U.S. TCRP and the U.S. Federal Highway Administration as well as Natural Resources Canada.

In general, U of T Civil Engineering is bullish on transportation. The graduate program Director sees a growing demand in the field, because of increasing concern about congestion and worries about sustainability. The Civil Engineering Department is actively trying to expand its operations in an attempt to meet the anticipated demand.

The Faculty of Applied Science Engineering Professional Development Centre also offers a number of courses related to transportation. Prerequisites generally are an undergraduate degree, or five or more years related work experience. Students earn continuing education credits (CEUs) for attending these courses. Courses listed for the spring of 2000 include:

> **Analytical Transportation Planning,** a comprehensive five-day workshop presenting the latest analytical methods for the analysis of traffic and travel problems designed to devise better ways of moving people and goods. ($1,875)
>
> **Public Transport,** a 13-week, two-hour lecture course which provides a broad perspective on Public Transportation, from the policy, planning, management and operations points of view. ($850)
>
> **Airport Planning and Engineering,** a 13-week, two-hour lecture which provides an

University of Manitoba

In addition to the activities of the University of Manitoba Transport Institute (UMTI) and the Faculty of Agricultural and Food Sciences–discussed above, the Civil Engineering Department maintains undergraduate teaching and an active graduate program in transportation. Two tenured positions are allocated to the transportation program at the present time.[44] One of the two faculty members has a broad multi-modal background and the other specializes in highway pavement design. The two in 1999-2000 compares with 2.5 in 1981-82 (when the TUP were operative) as well as others who had some interest in transportation.

We consider it very important to note that one of the two faculty positions is a recent appointment of a young academic. This situation indicates commitment to continuity of the transportation program–a situation that differs from that in some other universities.

The following formal transportation courses are offered in 1999-2000.

Undergraduate[45]

Transportation Engineering 1	*(38 students)*
Transportation Engineering 2	*(51 students)*
Highway Pavement Design	*(21 students)*
Urban and Regional Transportation Planning	*(14 students)*

Graduate

Pavement Evaluation and Performance	
Highway Materials and Construction	
Analysis of Freight Systems	*(4 students)*
Traffic Systems Engineering	*(4 students)*

There are also reading type courses built around the students' interests and graduate students are encouraged to take the transportation course offered by the Department of Geography or the logistics course offered in the Faculty of Agricultural and Food Sciences.

In 1981-82, the following courses were included in the curriculum.

Undergraduate

- Transportation Engineering 1
- Transportation Engineering 2
- Highway Pavement Design
- Urban and Regional Transport Planning

Graduate

- Transportation Planning
- Traffic Systems Analysis
- Asphalt Technology *[not offered in 1981-82]*
- Flexible and Rigid Pavements *[not offered in 1981-82]*
- Special Topics in Transportation
- Modern Railway Engineering
- Topics in Environmental Engineering (Movement of Hazardous Cargoes)

As of December 1999, there are two Ph.D. and five Masters students pursuing transportation studies in the Department of Civil Engineering. We were informed that research grant and contract monies of the order of $240,000 annually are largely used to support work by these students–and some undergraduates. We were also told that this is *pretty soft money* from a wide range of sources[48] and that it is difficult to plan more than a year ahead or so–and impossible to think more than 3 years ahead except to the extent they are able to acquire NSERC operating funds.

University of British Columbia

The University of British Columbia (UBC) provides undergraduate courses in roads and transportation and has a formal graduate program in Transportation Engineering. Students with undergraduate degrees in disciplines other than engineering are considered for admission. The program is dedicated to roads and road users, and urban transit. It does not extend to non-transit rail, air or marine modes, except to the extent that students are encouraged to include transportation courses outside of the Department in their programs. This particularly includes the Commerce and Business Administration courses (discussed above) as well as the Geography Department and the School of Community Planning.

Transportation courses and courses with a substantial transportation component[47], offered within the Department of Civil Engineering, include:

Undergraduate

Transportation Engineering 1	[required for all 3rd year Civils]
Transportation Engineering 2	[elective in 4th year]
Transportation Planning Methods	[elective in 4th year]

Graduate

- Principles of Pavement Design
- Transportation Engineering Impacts
- Urban Engineering Methods and Models
- Urban Transportation Systems Analysis
- Transit Operations Engineering
- Transit Design Engineering
- Traffic Flow Theory

Not all of the graduate courses are taught every year. There are two professors who could be

characterized as transportation specialists with others who can provide support in the area.

As of January 2000, UBC Civil has ten transportation Masters and four transportation Ph.D. students (full and part time). Over the last 10 years, approximately 20 Masters and 4 Ph.D.s have graduated from the program.

The *Professional Partnership Program* for graduate students was brought to our attention as of common interest to industry, university professor and transportation graduate student. The projects are usually funded to the expent of about $20,000, and can be completed in 8 months. We were told that the majority of the Department's transportation graduate students are supported by this program through the BC Ministry of Transportation and Highways, and the Insurance Corporation of British Columbia. Total research money to the department is, on average, about $150,000 per year.

University of Waterloo

At the University of Waterloo, one transportation course (CIV E 342-*Transport Principles and Applications*) is included in the core undergraduate curriculum for Civil Engineering students. Transportation is one of a number of technical electives for the undergraduate degree and this option includes the following courses:

- CIV E 344 Urban Transport Planning
- CIV E 440 Transport Systems Analysis
- CIV E 442 Pavement Structural Design
- CIV E 443 Traffic Engineering.

Waterloo also has a Transportation Engineering option for both its M.A.Sc. and Ph.D. programs in Civil Engineering. The following graduate courses are offered:

- Civ E 640 Urban Transportation Planning
- Civ E 643 Pavement Management Systems
- Civ E 644 Fundamentals of Traffic Flow Theory
- Civ E 741 Case Studies in Transportation Engineering
- Civ E 742 Public Enterprise Economics and Finance
- Civ E 743 Transportation Risk Analysis
- Civ E 744 Freeway Traffic Management
- Civ E 745 Transportation Networks: Models, Algorithms and Computer Applications.

All of the courses appear to be offered on a regular basis. Graduate students are also encouraged to take cross-disciplinary courses in transportation economics, human behaviour, optimization, computing technology and GIS systems.

The undergraduate transportation class is approximately 70 students. There are seven graduate students at the masters level and four at the doctorate level. New student intake was typically four or five per year in the 1980s and peaked at nine new students in 1991. We were told that the numbers of graduate students dropped during the mid- to late-1990s. This was attributed in part to a deliberate reduction in student intake after an early retirement program reduced the academic staff and in part *"there not being as much money available for graduate student support."* With recent hires, enrollment may increase in the next few years. Four graduate students entered the program in 1999-2000.

The transportation academic staff–known as the Transportation Systems Group–consists of three full-time professors, two adjunct professors (who have other academic and research responsibilities within the university) and two emeritus professors.

There is also a strong tie between the Transportation Systems Group and the Institute for Risk Research, housed in Waterloo's Faculty of Engineering. Transportation thesis research is undertaken in the following areas: Intelligent Transportation Systems (ITS); transportation risk and road safety; energy and environment; transportation economics and planning; pavement design and management; traffic flow theory and capacity analysis; and public and multi-modal transportation. Research funding has been received from: NSERC; the Canadian Foundation for Innovation; the Metropolitan Toronto Department of Roads; the Ministry of Transportation of Ontario; Transport Canada; the OECD; and the UK Health and Safety Executive.

Carleton University

Carleton offers a Ph.D. and an M.Eng. in Civil Engineering with specialization in Transportation. We were told that the transportation program is considered viable and recognized and that it is a part of the future plans of Carleton University.

In 1969-70 and 1970-71 academic years, a number of graduate courses were added to the then existing courses. The first formal accreditation of the program took place in early 1970s. Carleton also indicated to us that it has a joint program in Transportation with Lakehead University.

Carleton University, in association with the University of Ottawa, offers courses that cover transportation planning and management, traffic engineering, transportation economics and policy, airport planning, transportation terminals, pavements and materials. There are opportunities for interdisciplinary studies in transportation involving resources of the engineering, geography, economics, and mathematics departments.

There are three substantive faculty members specializing in transportation topics, especially pavement technology and urban traffic considerations. There are also six adjuncts (professionals with positions in industry or government who teach in the evenings). None of the substantive faculty are indicated on the Department's web site as teaching any of the formal graduate courses for 1999-2000 listed under the transportation program.[48]

- 82.533 (CVG7160) Pavements and Materials *[not offered in 1999-2000]*
- 82.534 (CVG7150) Intercity Transportation Planning and Management *[by adjunct]*
- 82.535 (CVG7151) Traffic Engineering *[by adjunct]*
- 82.536 (CVG7152) Highway Materials *[not offered in 1999-2000]*
- 82.537 (CVG7153) Urban Transportation Planning and Management *[by adjunct]*
- 82.538 (CVG7154) Geometric Design *[not offered in 1999-2000]*
- 82.539 (CVG7155) Transportation Supply *[not offered in 1999-2000]*
- 82.541 (CVG7156) Transportation Economics and Policy *[not offered in 1999-2000]*
- 82.542 (CVG7159) Transportation Terminals *[not offered in 1999-2000]*
- 82.543 (CVG7158) Airport Planning *[not offered in 1999-2000]*
- 82.560 (CVG7131) Project Management *[not offered in 1999-2000]*
- 82.571 (CVG7161) Traffic Related Air Pollution *[cancelled for 1999-2000]*

- 82.585-82.589 (CVG7310-7314) Special Topics in Transportation Planning and Technology *[cancelled for 1999-2000]*

Respecting the cancellations, we were told that, during 1999-2000 Academic Year, most faculty members were on sabbatical leave or on research leave. This was cited as the reason for cancelling a number of courses.

In addition to the above courses, students may take courses in Statistics, Operations Research, Econometrics, Public Administration that relates to transportation, and geography courses such as GIS and spatial systems. These could be taken at Carleton or at the University of Ottawa.

Enrollment in the Transportation Program for 1999-2000 includes 6 full-time and one part-time Ph.D.s and 11 full-time and 4 part-time M.Eng. candidates. Between 1986 and 1999, six Ph.D.s and 25 M.Eng. degrees have been awarded–an average of 2.2 graduates annually.

Others

The following do not represent all of the other universities that include or have included transportation in their civil engineering programs. Rather, those listed represent situations where transportation teaching has been reduced to the extent that, in our view, an effective transportation program no longer exists. In each of the cases cited the response of the university/department to a lack of student demand and/or resources (professors) to give the courses has differed.

Queen's University

Into the early 1990s, Queen's University had an active transportation program in Civil Engineering and (to a lesser extent) in the School of Business.[49] There was also transportation research interest in Mechanical Engineering, Psychology and Geography. Much of this transportation interest and capacity no longer exists. For the most part, Queen's Civil Engineering Department now views transportation as a "mature" subject and has not been replacing transportation faculty.[50]

As academics with an interest in transportation have left the department, they have been replaced with ones specializing in environmental engineering and other disciplines. Only two staff with a transportation interest remain–only one of them really a transportation specialist. The department's academic offering is now down to two technical design courses[51] and one transportation planning course. The latter course may soon be eliminated due to early retirement. There have been no graduate students specializing in transportation for four or five years. Ten years ago there was a core of eight or more graduate students in interested in transportation.

University of Saskatchewan

The Civil Engineering Department of the College of Engineering has a transportation option at both the undergraduate and graduate level. In addition to special topic and project courses which are used for transportation content, the department offers six specific transportation courses:

Undergraduate

- C E 227.3 Transportation Engineering I (last offered 2000-2001)[52]
- C E 467.3 Transportation and Regional Development.

Graduate

- C E 861.3 Transportation Planning
- C E 862.3 Transportation Systems Engineering
- C E 866.3 Pavement Management System I
- C E 867.3 Pavement Management System II.

We have not been able to determine how frequently these courses are available to students, but it is our understanding that course offerings have been curtailed during the last five years.

The number of transportation students is much lower than it had been. Presently there are 13 undergraduate students (one third of the class) doing a fourth year project in transportation. There are approximately ten masters level students in transportation, half full-time and half part-time. There are two Ph.D. students, one full-time and one part-time.

We were told that the reduction in enrollment is related to staff reductions: two of the three transportation professors retired five years ago and were not replaced. The department has only recently hired a new transportation specialist who has been on leave to complete his own Ph.D. There have been some problems getting financial support for graduate students and more of getting support for transportation in general within the university. We were told that *transportation is not the fair-haired boy any more, the resources are moving swiftly to software and information technology.*

We were also told that the department has had no problems in identifying–and sometimes in attracting–quality graduate students to transportation but many of them tend to migrate out of transportation. Four of five recent doctoral students moved to computer-related fields during their program due to the much higher earnings potential. Many students who have finished programs and gone into the private sector have ended up in information technology rather than transportation positions.

On a more positive note, we were told that the situation for transportation is improving at the University of Saskatchewan, especially with the new transportation specialist in Civil and a transportation professor in the Agricultural Economics Department, but the question of achieving a *critical mass for interest* in transportation remains open. Civil Engineering faculty interviewed do not believe that the program will ever be as large as it once was; however, a *"respectable"* program is expected–one that is well connected with NSERC and has matching industrial supporters.[53]

McGill University

Although McGill offers transportation courses within various faculties and departments of the university[54] and a *Certificate in Transportation* under McGill's Department of Career and Management Studies (continuing education), the only aggregation of courses that would approach a degree program is in the Department of Civil Engineering. Until three years ago, there were two

academic staff members in transportation. One has retired and is not being replaced, however, due to budget cuts. The remaining transportation professor holds a cross-appointment with Urban Planning. His time commitment to Civil Engineering is 40%. In this respect, we were told that the Department will not be able to maintain this program for long under these circumstances.

Undergraduate students in McGill's Civil Engineering Department have a choice of specialization for the elective courses: Environmental, Structural, Geotechnical, and Transportation. The Transportation Program courses include:

- 303-440A Traffic Engineering *[given by adjunct]*
- 303-540A Urban Transportation Planning[55]
- 303-541A Rail Engineering *[given by adjunct]*
- 303-433B Urban Planning *[taught by School of Urban Planning]*
- 303-446A Construction Engineering *[given by adjunct]*
- 303-587A Pavement Design *[given by adjunct[56]]*
- 154-404B Transportation Economics *[not offered 1999-2000]*

The first three courses are "highly recommended" but not obligatory. We were told that the structure of the specialization options will be changing in the coming year(s). We were told that from fifteen to twenty students take the elective courses. Typically six to eight students per year do a final project in the transport area. These numbers have been increasing slightly in the past few years, even though Civil Engineering enrollment has been declining.

McGill also offers a graduate program in Civil Engineering, although we were told that the department does not advertize it widely as an option. This is because of the limit to the number of students that the single (part-time) faculty member can handle. As of late 1999, there are two M.Eng. students and one Ph.D. student. Following the professor's interests, transport thesis research in Civil Engineering has quite naturally been focussed on urban transportation demand modelling. The one Ph.D. student is working on the impact of transport on regional environment. One of the masters students is working on trip assignment while the other student is working on rail grade crossing design. A new masters student (starting in January, 2000) is interested in maintenance procedures for logging roads.

University of Alberta

The University of Alberta Department of Civil and Environmental Engineering lists eleven specific transportation courses in its calendar plus a number of other closely-related courses. These transportation courses include:

Undergraduate

- CIV E 312 Transportation Engineering
- CIV E 412 Highway Engineering

Graduate

- CIV E 511 Traffic Engineering and Planning *[cancelled]*
- CIV E 610 Pavement Design *[cancelled]*

- CIV E 611 Pavement Materials *[cancelled]*
- CIV E 612 Transportation Design *[cancelled]*
- CIV E 613 Transportation Systems Analysis *[not offered]*
- CIV E 614 Transportation Engineering *[cancelled]*
- CIV E 616 Public Transportation *[cancelled]*
- CIV E 696 Geotechnical Aspects in Highway Engineering *[cancelled]*
- CIV E 719 Advanced Topics in Transportation and Highway Engineering *[not offered]*

A review of the university's course timetable (on its internet site) indicated that only two of the transportation courses (312 and 412) are being offered during the 1999-2000 academic year. Seven of the remaining courses are listed as *"Section cancelled"*, while the remaining two courses are not included in the timetable at all. The faculty lists and research descriptions included no reference to transportation specialities.

In reply to our inquiries with respect to the transportation education at the University of Alberta, we were told that the University of Alberta Department of Civil and Environmental Engineering has decided to drop its graduate program in Transportation Engineering. Coupled with this, was a decision not to make any further academic appointments in the transportation field, following the retirement (in June, 1999) of the one remaining faculty member specializing in transportation. We were told that there were a number of factors that contributed to these decisions. Staff changes were a factor. The fact that the University of Calgary has a focus on transportation engineering was another factor. In the end, it came down to a question of whether the department should attempt to maintain programs in all the subdisciplines of Civil Engineering, or whether it should focus on those in which it has strength.

The Department still has two graduate students who are completing their transportation programs. They will be supervised by a Professor Emeritus who remains active in the Department and will continue in this role for the next few years.

U of A plans to retain its *core* undergraduate course in Transportation Engineering. CIV E 312 will continue to be part of the curriculum. This year it is being taught by a sessional instructor who is a practising engineer in the area. Longer term, the department is seeking to fill a Civil Engineering vacancy in the *materials* area with a person with sufficient expertise in the transportation area, that he or she can teach the *core* undergraduate course.

Lakehead University

Lakehead's Civil Engineering Department has a single transportation specialist with a research interest in highway design and traffic operations. One core course is offered (ENGR3138 Highway Design) with a current enrolment of 11 students. Two transportation electives are also offered: ENGR0553 Traffic Engineering (13 students) and ENGR0137 Transportation Systems (10 students).

The Faculty of Engineering also houses a *Transportation Research Centre* headed by the Civil Engineering transportation specialist. The Centre's objective is to focus and strengthen transportation research at Lakehead, including interdisciplinary research, with a view to expanding the research network to local, provincial and federal organizations. We were informed that researchers from Lakehead and Carleton and several Ph.D. students are currently working on a number of research projects, including highway design, pavement cracking and freight transportation planning.[57]

Concordia University

Concordia has a single full-time tenured professor responsible for teaching all undergraduate and graduate courses in Transportation Engineering.[58,59] At the undergraduate level, Concordia's Civil Engineering Department includes Transportation Engineering (CIVI 372) in its core undergraduate curriculum and offers two transportation courses as fourth year options: Highway and Pavement Design (CIVI 471) and Transport Planning and Design (CIVI 474). All three courses were offered in 1999-2000, and we were informed that they are offered every year.

At the Masters level, Concordia lists Transportation as one of the seven areas of specialization. Four specific courses are included in the calendar:

- CIVI 640 Transportation Systems Analysis
- CIVI 641 Urban Transportation Planning
- CIVI 644 Traffic Engineering
- CIVI 790 Design of Transportation Terminals.

Only CIVI 640 is listed as being offered in 1999-2000. The single member of the academic staff with an interest in transportation reports that he cannot teach all of the transportation courses (graduate and undergraduate) offered by the department. We were informed that the graduate courses are offered periodically in rotation. Sometimes they are offered as reading courses for small groups of Ph.D. and M.A.Sc. students who are working on transportation theses. Reading courses do not appear in the list of graduate courses offered each year in the Civil Engineering graduate program.

We were informed that the enrollment of students in undergraduate transportation courses (CIVI 372, 471 and 474) varies from 20 to 30. At the graduate level, 10 to 15 students are reported to take CIVI 641 every year, and graduate students (Ph.D. and M.A.Sc.) who specialize in transportation are reported to average about 1 or 2 students per year. Occasionally, 2 to 3 students work on M.Eng. (Master of Engineering) projects in Transportation (worth 3 to 9 credits).

University of Regina

Historically, the University of Regina maintained an interest in transportation education. Within the Faculty of Engineering, the Environmental Systems Department offers some transportation courses. One course is included in the core undergraduate curriculum: ENEV 372 Transportation Systems. Three transportation elective courses are offered *"only when feasible"*. These include:

- ENEV 472 Urban Transportation and Land Use
- ENEV 475 Traffic Engineering
- ENEV 484 Highway Design

These three courses have been offered on a regular basis in recent years with typical enrollment of a dozen students per course. We note that the department includes one Assistant Professor of Transportation Engineering with an active highway and roadway safety research program.

University of Windsor

The Civil Engineering program includes two elective transportation courses which are: Transportation and Traffic Engineering (87-314) and Highway Design and Construction (87-414). There is also a graduate course in the materials area that deals with the durability of some of the pavement materials. This is not specifically a transportation course.

McMaster University

The Civil Engineering Department has two professors with an extensive research interest in transportation. Four undergraduate courses in the transportation and transportation-related area are offered:

- CE 3K03 Introduction to Transportation Engineering
- CE 4D04 Geometric Highway Design
- CE 4H03 Land Use and Transportation (jointly with Geography)
- CE 4G03 Pavement Materials and Highway Design

There are no graduate programs or courses in transportation.

University of Western Ontario

Although Western does not appear to offer any specific transportation courses within its Faculty of Engineering, the faculty is the home for the Multi-Disciplinary Accident Research Team (MDART), one of a number of Transport Canada-funded institutions with a mandate in road safety investigations.

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[38] According to the *Transportation Studies* prospectus, *"The Transportation Group is located within the Department of Civil Engineering although we enjoy the cooperation and support from a variety of academic units including the Department of Economics."*

[37] We are informed that all the undergraduate courses are offered regularly.

[38] It is noted that a member and former Coordinator of the UNB Transportation Group is Chair of the APENB Continued Competency Assurance Committee.

[39] One of these–Professor Albert Stevens–personally funds the postdoctoral chair. We were told that this funding, otherwise *in perpetuity*, is contingent on the university maintaining the faculty

complement of the Transportation Group.

[40] This description is written in English on the basis of interviews, discussions and written material that were primarily in French. Names etc. used here may not match official translations or those used in equivalent material that might be available in English.

[41] Dr Karsten Baass was interviewed by Louis-Paul Tardif and Richard Lake.

[42] Enrolment was 55 in 1999.

[43] Enrolment of 8 to 10 students reported. If less than 5 students enroll in a course, and the professor still gives it, teaching credit is not given and historical records are poor.

[44] Two adjunct members of faculty–well known transport researchers–do not have direct instructional responsibility.

[45] Final year students may also elect to do their thesis in transportation. In this respect, we were told that, over the last ten years of so, five winners of the prize for the best thesis in civil engineering were transportation students.

[46] We were told that more than 1/3 of this comes from U.S. sources.

[47] There are other related courses with a more minor transportation component.

[48] Note: 82.xxx numbers show Carleton University designation and CVGyyyy are the corresponding University of Ottawa numbers.

[49] The School of Business used to offer courses at the undergraduate and graduate level in both logistics and transportation. These courses have been eliminated in part due to significant changes in curriculum emphasis which has reduced the choice and number of electives available to both undergraduate and graduate (M.B.A.) students. There have been no graduate students specializing in transportation in the last three or four years. Three staff with a significant research and consulting transportation interest remain with the School of Business but this number is expected to decrease due to retirements. A transportation course had also been offered by the Economics Department but was eliminated due to a lack of interest on the part of both students and staff. Transportation is now covered as a topic within a half course in Regulatory Economics.

[50] We were told that reductions in the level of government funding for research, especially at the provincial level, has also contributed to the Department's loss of interest in transportation.

[51] We were told that these consist of two formerly full courses which have been compressed into what is essentially a pair of half courses.

[52] CE 329.3 will replace CE 227 in 2001.

[53] The College of Engineering is also home to a four-person Transportation Centre which historically has engaged in traffic safety issues with funding from Transport Canada. The Centre does not have an educational mandate, but has served to interest some students in undertaking further studies in transportation.

[54] The Urban Planning program at McGill includes one course (Transportation and Land Development) and three graduate students are currently working on a transport topic. The Economics Department has a single elective course in Transportation Economics at the senior undergraduate level but it has not been offered in the last few years since the Department has no staff to teach it. The Faculty of Management offers a Logistics Course at the graduate level course and open to M.B.A. and Masters of Manufacturing Management students. Enrollment is approximately 25 students.

[55] 500-level courses are designed for graduate and senior undergraduate students.

[56] We note that the *adjunct* instructor for this course had been one of McGill's full-time transportation specialists. This professor has assisted the Department with the transportation program for a few years since retirement, but his involvement is not expected to continue for long.

[57] See Carleton University above.

[58] He is also responsible for the core course CIVI 341 (Civil Engineering Systems), which is given annually and is which is closely related and a prerequisite for the undergraduate transportation courses.

[59] The department also has an active program involving bridges. While this is certainly transportation-related, it is not transportation education for the purposes of this inventory.

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PROFESSIONAL TRANSPORTATION EDUCATION PROGRAMS: NON-UNIVERSITY PUBLIC SECTOR EDUCATIONAL INSTITUTIONS

A number of Community Colleges and Cégeps have transportation programs or programs with a significant transportation and logistics content. Some give transportation and logistics courses– sometimes in conjunction with professional organizations[60] such as the Canadian Institute of Traffic and Transportation (CITT) or the Canadian International Freight Forwarders Association (CIFFA)– which are available as options within business programs or through continuing education programs.

The following is a listing of Canadian Colleges (as drawn from the membership lists of the Association of Canadian Community Colleges) to which e-mail or fax inquiries were sent starting September 28, 1999. Follow-up reminders were sent to Institutions which had not responded in mid-October and again in early November. Some specialized institutions were not included in the survey.

The information regarding programs is what was provided by return e-mail or fax or obtained through subsequent telephone and e-mail contact. In a number of cases, as a result of our initial inquiries, we were directed to the college's internet-based general academic calendars and specific program websites. We also scanned the calendars and websites of institutions which had not responded to our initial inquiries by early December.

We note that many colleges offer technical programs in vehicle maintenance, commercial driver training, marine or air transportation, and related subjects. We have noted these programs in cases where the information was specifically provided or where it was immediately obvious. At some institutions, such programs and courses are offered under the heading of *Transportation* or *School of Transportation*. In these cases, we have included sufficient information to ensure that there is no confusion. We have **not** made an all-inclusive inventory of such technical courses. We also note that many colleges offer programs which prepare students for careers in the travel industry. A review of a representative sample of the course content indicated that such programs did not fall within the definition of transportation used for the purposes of this inventory. Thus, such programs have not been included.

COMMUNITY COLLEGES AND CÉGEPS

ALBERTA		
Alberta College	Edmonton	We do not offer programs or courses in Transportation
Alberta Vocational College	Edmonton	Response indicated no transportation programs offered.
Bow Valley College	Calgary	Bow Valley College does not offer programming related to transportation.
Fairview College	Fairview	The Warehouse Training program which includes course WT211-Transpor-tation and Traffic which includes mode choice and freight rate calculations.
Grande Prairie Regional College	Grande Prairie	The following were found on website: FO 3350 Timber Harvesting and Transportation; BA 2410 Introduction to Logistics and Physical Distribution. The logistics course has not been offered for the last two years and the department has no plans to offer it again. There were only 15 students in the last class. This course is not tied in with the CITT or any other professional association but was part of the ***Marketing Management*** Curriculum.
Grant MacEwan Community College	Edmonton	Grant MacEwan offers nothing in this area.

Keyano College	Fort McMurray	Only has heavy equipment maintenance and driver programs.
Lakeland College	Fort Kent	Lakeland College does not offer this program.
Lethbridge Community College	Lethbridge	The business administration program includes course MKT 281 Marketing Logistics for marketing majors.
Medicine Hat College	Brooks	[No relevant courses identified.]
Mount Royal College	Calgary	Mount Royal College does not offer courses in this area.
Northern Alberta Institute of Technology (NAIT)	Edmonton	Only course is "Transportation of Dangerous Goods Instructor Certification".
Olds College	Olds	[No relevant courses identified.]
Red Deer College	Red Deer	No relevant courses identified.]
Southern Alberta Institute of Technology (SAIT)	Calgary	Has an extensive transportation and aviation program. For the most part, these are technical courses. Automotive Marketing is typical of the business courses in "transportation".SAIT also has a strategic alliance with Canadian Pacific which led to the opening of a fully-integrated Railway Training Centre in November 1999. The Railway Training Centre will provide training in technical topics for CP, and the company will consolidate all of its training at the Centre. SAIT also provides negotiation, communications, and other non-technical training for CP's front-line managers. A press release from SAIT indicates that the railway courses may in the future be opened up to staff from other railways and to non-railway employees (perhaps as part of a diploma program).
BRITISH COLUMBIA		
British Columbia Institute of Technology (BCIT)	Burnaby	We were told that BCIT's main Transportation/logistics program starts approximately 54 students each fall, and that approximately 40 graduate 2 years later. This is the fourth year of the program, and the present program originated from 2 programs, one in Marketing and one in Operations Management (the transport program). The latter program dates back to 1971 with over 850 graduates from both the original programs and the current merged one. Basically, the daytime transport courese are not open to other students. If students want, they can register for one of the Continuing Education courses at night. (Generally the ones that are offered in conjunction with one of the associations). BCIT has an International Trade and Transportation program (a part-time and a full-time program), an International Trade Training Diploma, A Transportation Systems (Highways) Technology *distance education* program, and an International Freight Forwarding program. See text. BCIT provides *Continuing Education* courses for the Canadian Institute of Traffic and Transportation in Transportation Economics and Transportation Law

		There are also 15-20 technical programs (aviation, mechanics, drivers, deckhand, deck officer cadet, etc.)
Justice Institute of British Columbia	New Westminster	Not included in survey.
Camosun College	Victoria	We have no such programs.
Douglas College	New Westminster	Response indicated no transportation programs offered.
Capilano College	North Vancouver	Sorry, we do not offer any programs in transportation.
University College of the Cariboo	Kamloops	Sorry, no we don't offer any transportation programs.
University College of the Fraser Valley	Abbotsford	Offers a number of aviation courses (Certificate, Diploma, BBA Degree). The aviation programs are offered in conjunction with Coastal Pacific Aviation and Trinity Western University Also offers a number of technical programs in the automotive and commercial vehicle fields.
Northern Lights College	Dawson	Offers programs in Aircraft Maintenance Engineering, Professional Driver Training and Commercial Transport Technicians.
College of the Rockies	Cranbrook	Offers *Principles of Transportation* (121) as part of the Business Administration program. This course is approved by the Purchasing Management Association of Canada, but has not been offered lately as the instructor is now department head. It is not know when this course will be offered again. Other programs are available in autobody, automotive service technician, etc.
Kwantlen University College	Surrey	I'm sorry, but we do not offer a course like this.
Langara College	Vancouver	Unfortunately, we do not offer anything in that area here at Langara College.
Malaspina University - College	Nanaimo	Response indicated no transportation programs offered.
College of New Caledonia	Prince George	CNC does not offer a certificate/diploma program or courses in transportation. The Continuing Education department offers short courses such as 20-hour one on Air Brakes
Selkirk College	Castlegar	Offers a Professional Aviation Program for pilot training. The business calendar notes that Selkirk courses are recognized by the CITT. No transportation or logistics courses, however, were identified.
Okanagan University College	Kelowna	
Nicola Valley Institute of Technology	Merritt	Not included in survey.
North Island College	Courtenay	NIC offers a series of courses under Motor Vehicle Operating Skills program.
Open Learning Agency	Burnaby	Response indicated no transportation programs offered.
Vancouver Community College	Vancouver	Offers a program called "Traffic, Customs and Transportation". This nine-month program includes four transportation and logistics courses plus two work-experience courses in transportation.
Northwest Community College	Terrace	Northwest College offers classes in: Professional Driver Training; Commercial Vehicle Inspection; and Air Brakes. In addition, we have a Commercial Transport Repair option in our Entry Level Mechanical program.
MANITOBA		

Assiniboine Community College	Brandon	We do not offer any courses in the transportation field.
Keewatin Community College	The Pas	Keewatin Community College offers a Truck Driver Training program.
Red River College	Winnipeg	Offers some of the introductory CITT courses.
Collège Universitaire de Saint-Boniface	Saint-Boniface	Nous n'offrons pas cette formation.
Winnipeg Technical Centre	Winnipeg	[No relevant courses identified other than automotive/truck maintenance.]
Yellowquill College	Portage la Prairie	We do not offer any programs in the transportation field.
NEW BRUNSWICK		
Collège Communautaire du Nouveau Brunswick	Fredericton	
CCNB - Bathurst	Bathurst	Response indicated no transportation programs offered.
CCNB - Campbellton	Campbellton	
CCNB - Dieppe	Dieppe	Offers some courses in conjunction with CITT. Also offers a three year, co-op Business Technology program with a Transportation Option (see text) and a one-year logistics program.
CCNB - Edmundston	Edmunston	
École des pêches du Nouveau-Brunswick	Caraquet	
New Brunswick Community College (NBCC)	Fredericton	
NBCC - College of Craft & Design	Fredericton	
NBCC - Miramichi	Chatham	
NBCC - Moncton	Moncton	Offers a two-year Civil Engineering Technology option in Highway and Municipal Transportation as well as contract training for roadbuilders and highway supervisors. In addition, there are technical programs in aircraft maintenance, avionics and other truck and automotive maintenance.
NBCC - Saint Andrews	Saint Andrews	Offers a number of technical programs in marine transportation as well as a five-weekend-long International Trade Certificate Program in conjunction with FITT. One of the courses for this certificate is International Trade Logistics.
NBCC - Saint John	Saint John	Offers automotive sales and related technical programs.
NBCC - Woodstock	Woodstock	Offer a Transportation Clerk program (40 week) which provides students with the skills necessary to be employed in clerical areas within transportation.
NEWFOUNDLAND AND LABRADOR		
Centre for Nursing Studies	St. John's	Not included in survey.

College of the North Atlantic	St.John's and other	The three-year Civil Engineering Technology Diploma program includes a highway design course as well as urban planning courses with a transportation component. There is a 16-week Commercial Transport Certificate program plus related certificate programs in road transport and vehicle maintenance.
Marine Institute	St.John's	Offers a wide variety of marine related Diplomas of Technology including several pertaining to the marine transportation industry. Also offers training leading to examination in the Transport Canada Certificate of Competency program for both the Nautical Science and Marine Engineering fields.
NOVA SCOTIA		
Collège de l'Acadie	La Butte	[No relevant courses identified.]
Nova Scotia Agricultural College (NSAC)	Truro	The NSAC does not offer such a course.
Nova Scotia Community College (NSCC)	Halifax	A two-year International Business program is offered at the Truro campus. This program includes an international logistics course.
University College of Cape Breton	Sydney	[No relevant courses identified.]
NUNAVUT		
Nunavut Arctic College	Iqaluit	Not included in survey.
NORTHWEST TERRITORIES		
Aurora College	Fort Smith	Not included in survey.
ONTARIO		
Collège d'Alfred	Alfred	[No relevant courses identified.]
Algonquin College	Nepean	The one-year post-diploma International Business program includes one course: MGT 2104 International Physical Distribution . The Transportation department offers motive power technology courses.
Collège Boréal	Sudbury	The two-year undergrad International Business program includes Logistique du commerce international (FITT course 4).
Cambrian College	Sudbury	[Website only shows motive power technology and tourism.]

Canadore College	**North Bay**	**Includes a School of Aviation which is all technical education.** **Subject to Ministry approval (which we believe has been granted) Canadore is developing a one-year post-diploma SupplyChain Management program to start in September 2000. The program--with a projected enrollment of 30 to 35 students--will include emphasis on shipping, transportation and traffic, distribution, transportation rate analysis, international transport, freight forwarding, and integrated logistics. The program would also include 100 hours of field placement.**
Centennial College	Scarborough	Includes a School of Transportation with many technical courses and programs in transportation operations and maintenance. The three-year co-op International Business program includes a single course in Traffic and Transportation although some of the other courses would appear to have a transportation component.
La Cité collégiale	Ottawa	Offers an aviation program.
Confederation College	Thunder Bay	Offers a single course (IN 312 - Traffic and Transportation Documentation, 54 hours) which introduces students to the freight forwarding industry, modes of transportation, commercial documentation, terms of trade, and so on. Also has aviation technology and management and motive power technology programs.
Conestoga College	**Kitchener**	**Through Continuing Education offers CITT's Distribution I & II as well as the Purchasing Management Association of Canada's (PMAC's) Principles of Transportation course.**
Durham College	Oshawa	[No programs or courses of relevance on website.]
Fanshawe College	London	Transportation courses are limited to professional driver training.
Collège des Grands Lacs	Welland	[No relevant courses identified.]
Georgian College	**Barrie**	**Offers six courses in transportation, distribution, logistics and supply chain management, and strategic planning in the transportation industry. Two are equivalent to the basic CITT courses and are recognized by the CITT. Within Continuing Education, offers the APICS Certificate in Production and Inventory Management which has a transportation/logistics component as well as the PMAC's Principles of Transportation course.** **(Subject to approval) the college will offer a three-semester (2 academic, one internship) post-diploma program in Logistics and Supply Management. Four of the 12 courses will specifically be logistics and transportation.** **Houses the Canadian Aviation Institute which is mainly technical in nature, but includes some management and general transportation courses.**

George Brown College	**Toronto**	**Although George Brown College told us that it does not offer transportation courses, a post-diploma Certificate in International Trade which has a small transportation/logistics component plus an optional logistics management concentration for the Diploma in Business program were identified.**
Humber College	**Toronto**	**Humber offers a three year diploma in Logistics Management. The program includes courses in domestic transportation (I and II), logistics, freight forwarding, and international transportation. Humber has an affiliation with CALM and CIFFA and provides CIFFA's Toronto courses and administers the examinations for its correspondence courses.** **In addition, there is a three year diploma course in Flight and Aviation Management and a Centre for Transportation Training which targets the road transport sector with courses in driver training, air brakes, logbooks, dangerous goods and customer service for commercial drivers.**
Kemptville College of Agricultural Technology	Kemptville	
Lambton College	Sarnia	The International Trade Program has some transportation aspects. Within the regular business program, there is a logistics course (MKT 341-3 Logistics) included as part of the marketing option.
Loyalist College	Belleville	Loyalist College does not offer courses in transportation
Michener Institute for Applied Health Sciences	Toronto	Not included in survey.
Mohawk College	**Hamilton**	**Has a three-year Transportation Engineering Technology co-op diploma program which includes the following: Transportation Technology (EA 105), Application of Computers in Transportation (CO 318), Transportation Planning I, II, and III (TR 151, 251 and 552), Traffic Engineering I, II and III (TR 301, 401 and 503), Traffic Studies (TR 310), Transportation Design I, II and III (TR 462, 562, and 552), Urban Planning (MP 126), Public Transportation (TR 593), and Computer Traffic Systems (TR 692). Two transportation project courses are also required.**
Northern College	Timmins	Offers a Motor Vehicle Mechanic program.
Niagara College	Welland	Starting in the fall of 2000 will offer a three-year International Business Diploma which will have one course that has some reference to transportation. This course uses the Forum for International trade Training (FITT) material and has a unit called 'Transportation Management and Analysis' another entitled 'Shipping Freight Forwarders and Insurance, and a third 'Delivery and Distribution'. The course is more involved in logistics and logistics management *but of course one can't talk logistics and not discuss transportation.*
Ridgetown Agricultural College	Ridgetown	
St. Lawrence College	Kingston/Brockville	We do not offer any programs with a concentration of transportation courses .

St. Clair College	Windsor	The three-year Business Management - Marketing program includes a course in Physical Distribution Management (MRK 620). The Continuing Education Section offers the PMAC's Principles of Transportation course. The Community and Corporate Training Section offers Transportation Technology, a series of short courses and workshops.
Sault College	Sault Ste Marie	[Website only notes Motive Power Technology courses.]
Sir Sandford Fleming College	Peterborough	Offers various programs with affiliations to PMAC, APICS, CIFFA, and the Professional Logistics Institute. The three-year International Trade program. has required specialization courses in Transportation, Distribution and Logistics Management. The Materials Management and Distribution option in Business Administration includes required and elective transportation courses. The program is small and tends to concentrate in the area of manufacturing planning and control but, due to the wide knowledge base it services the transportation market as well.
Seneca College	**Willowdale**	**Offers a four-semester International Transportation Diploma. Most of the specific transportation content (8 of 20 courses) is devoted to customs, insurance and documentation (6 of the 8 transportation-related courses).** **Seneca also has a Department of Aviation and Flight Technology which is technical in content.**
Sheridan College	**Oakville**	**Offers a one-year post-graduate co-op program in International Business with a small transportation (freight forwarding) component and a similar program specifically in Logistics with nearly half the course content being directly transportation and logistics related.** **Provides *Continuing Education* courses for the Canadian Institute of Traffic and Transportation in Transportation Economics, Transportation Law and Physical Distribution.**
PRINCE EDWARD ISLAND		
Holland College	Charlottetown	Response indicated no transportation programs offered.
Société éducative de l'Ile du Prince Édouard	Wellington	
QUEBEC		
CEGEP de l'Abitibi-Témiscamingue	Rouyn-Noranda	Nous n'offrons pas de cours reliés au programme que vous mentionnez.

John Abbott College	Ste-Anne-de-Bellevue	Offers a two-year Aviation Management Program in conjunction with Laurentide Aviation and the Montreal Flying Club for training commercial pilots and managers. The program includes aviation subjects, aviation-related business courses and flight training.
Collège d'Alma	Alma	Nous n'avons aucun cours touchant le domaine du transport.
CEGEP André-Laurendeau	**LaSalle**	**Nous offrons le programme *Techniques de la logistique du transport*. See text.**
Collège de la région de l'Amiante	Thetford-Mines	
CEGEP Beauce-Appalaches	Ville Saint-Georges	The Technologie du génie civil program includes two highway courses.
Collège de Bois-de-Boulogne	Montréal	Nous n'offrons pas de programme ou de cours reliés au transport.
Champlain Regional College	Lennoxville	[No transportation-related programs or courses identified.]
CEGEP de Chicoutimi	Chicoutimi	Le Centre québécois de formation aéronautique du CEGEP de Chicoutimi offre un cours de pilotage d'aéronefs. Le cours est de trois ans et s'adresse aux étudiants du Québec seulement.
CEGEP de Drummondville	Drummondville	Nous ne dispensons pas de formation en transport.
Collège Édouard-Montpetit	Longueuil	Nous n'offrons pas le programme de spécialisation en transport. The college houses L'École nationale d'aérotechnique (ÉNA) which offers three-year programs in airport design, avionics, and airplane maintenance.
Collège François-Xavier Garneau	**Québec**	**Nous offrons le programme d'études Technique de la logistique du transport.**
CEGEPde la Gaspésie et des Iles	Gaspé	Response indicated no transportation programs offered.
CEGEP Heritage College	Hull	Currently, we do not offer a program with concentration in transportation. Our continuing education division may offer a pilot training program in the future.

Collège CEGEP de Lévis-Lauzon	**Québec**	**Programme d'études technique de la logistique du transport.**
Institut de technologie agro-alimentaire	St-Hyacinthe	l'Institut de technologie agroalimentaire de Saint Hyacinthe n'offre pas de formation en transportation. Par contre, les diplômés en Technologie de la transformation des aliments sont responsables des conditions de transports des aliments transformés de l'usine jusque chez l'épicier.
Institut de technologie agro-alimentaire	La Pocatière	Nous n'offrons pas cette formation.
CEGEP de Jonquière	Jonquière	
Collège Laflèche	Trois-Rivières	Le Collège Laflèche de Trois-Rivières n'offre pas de cours de transport.
CEGEP Régional de Lanaudière	Joliette	Notre établissement n'offre pas ce cours.
Collège LaSalle	**Montréal**	**Within our Business Administration program we offer International Transit I (410-168-85) and II (410-170-85) to complement Customs & Brokerage I (410-171-85) and II (410-172-85). We had originally set up an option in the program for International Transportation which never got certification from the Ministry as a subsidized option. This option contained the following courses for which we can issue certificates: Geography of transportation (320-945-92), Transportation techniques I (410-507-90), Logistics I (410-527-90), Transportation techniques II (410-607-90), Logistics II (410-627-90).**
Collège de Limoilou	Québec	No courses or program in transport is offered.
Collège Lionel-Groulx	**Ste-Thérèse**	**Offers a 3-year program in logistics and transportation. See text.**
Collège de Maisonneuve	Montréal	
CEGEP Marie-Victorin	Montréal	
Marianopolis College	Montreal	Not Offered.
Collège Médicisi	Québec	[No relevant programs or courses were identified.]
Collège de l'Outaouais	Hull	Nous ne donnons pas ces cours.

Collège de Rosemont	Montréal	[No relevant courses identified.]
CEGEP de Rimouski	**Rimouski**	**Houses the Institut maritime du Québec (IMQ) which offers a three-year diploma in Logistics and Transportation Techniques (410.A0). See text. The IMQ also has programs in marine engineering, naval architecture and navigation.**
CEGEP de Rivière-du-loup	Rivière-du-loup	
CEGEP de Sainte-Foy	Sainte-Foy	
CEGEP de Saint-Hyacinthe	Saint-Hyacinthe	Notre établissement n'offre pas ce programme.
CEGEP Saint-Jean-sur-Richelieu	St-Jean-sur-Richelieu	Le Cégep Saint-Jean-sur-Richelieu offrira en février 2000 un programme menant à une Attestation d'études collégiales en Transport.
CEGEP de Saint-Jérôme	Saint-Jérôme	Avec regret, nous ne donnons pas ce programme au Cégep de Saint-Jérôme.
CEGEP de Saint-Laurent	Saint-Laurent	Nous n'offrons pas de formation avec des cours dans le domaine du transport.
Collège Shawinigan	Shawinigan	Malheureusement, Monsieur, nous n'offrons pas ce programme.
CEGEP de Sorel-Tracy	Tracy	Nous n'offrons malheureusement pas de programme en transport.
Institut Teccart Inc.	Montréal	Not included in survey.
CEGEP de Trois-Rivières	Trois-Rivières	
Vanier College	St-Laurent	Response indicated no transportation programs offered.
SASKATCHEWAN		
Carlton Trail Regional College	Humboldt	
Cumberland Regional College	Nipawin	
Cypress Hills Regional College	Swift Current	The only transportation courses are Truck Driver Training and Air Brakes .
Northlands College	La Ronge	
Parkland Regional College	Melville	No.
Southeast Regional College	Weyburn	
North West Regional College	Nth. Battleford	

Saskatchewan Indian Institute of Technologies	Saskatoon	No programs.
Saskatchewan Institute of Applied Sciences and Technology (SIAST)	Saskatoon	The programs that are related to transportation are: Auto Body Technician, Automotive Service Technician/Technology, Heavy Equipment Mechanic, Industrial Mechanics, Truck and Transport Mechanical Repair, and Heavy Equipment Operator.
YUKON TERRIRORIES		
Yukon College	Whitehorse	We do not offer programs in transportation.

Discussion of Particular Programs

The most comprehensive programs which specifically target transportation and logistics have been developed in Quebec and New Brunswick. In Ontario, transportation and logistics are more often included as part of the curriculum of other business programs, especially some of the newer International Business programs.

The Cégep Techniques de la logistique du transport program

In Quebec, the following five institutions offer the three-year program *Techniques de la logistique du transport* (formation 410.A0) which integrates general education, general business subjects and transportation/logistics often with a *stage* or work-experience component:

- Collège François-Xavier-Garneau
- Collège CEGEP de Lévis-Lauzon.
- Collège Lionel-Groulx
- CEGEP André-Laurendeau
- Institut maritime du Québec (a component of CEGEP de Rimouski).

Since the general logistics curriculum is centrally set by the department of education, the program at each institution is similar and many of the courses are identical. For convenience, the program from the Institut maritime is shown below since it was readily available in English as well as French.

1st term	2nd Term
Literature and writing (5)	Literature (4)
Philosophy (4)	The human being (3)
Physcial education (2)	Physical education (2)

English (3)
Applied mathematics (5)
Computer sciences (3)
Introduction to logistics (5)
Economics, geography and transportation history (4)
Spanish (3) *
Relationship with clients (4)
National transportation principles (4)
International logistics principles (5)
World economy (4)

3rd Term

Quebec's literature (4)
Physical education (2)
Literal English (3)
Relationship with clients II (4)
Logistics of projects (4)
Control of logistics management (4)
Production systems (4)

4th Term

French (4)
Spanish II (3) *
Logistics networks and after sale service (4)
Distribution I (4)
Customs and international transportation (3)
Commercialization/international logistics (4)
Transportation law, contracts, insurance (4)
International payments (4)

5th Term

Logistics counselling and implementation (3)
On-the-job-training (8)
Distribution II (4)
Control of logistics management II (4)
Applied English for logistics (3)
Logistics leadership and management of personnel (4)

6th Term

Logistics for public transportation (3)
International logistics systems (4)
Integrated logistics for companies (4)
Applied English for logistics (3)
Organization of trucking companies (4)

Note: figures after the course title indicate the number of class and lab hours per week.
* Complementary courses. These vary from institution to institution.

The differences in the curriculum at other institutions are minor and tend to reflect different modal interests. The program objectives are the same for all CEGEPs, but each CEGEP has flexibility to create its own courses to fit particular needs as long as the program objectives are attained. For example, the program at the IMQ is tailored to marine transportation. Courses with an emphasis on school buses and public transportation are available at one institution and there may be more specific emphasis on road transport or customs at other institutions. There are also minor differences in the treatment of work experience and in a project to be undertaken in the final year of the program. A common thread of each of the five programs is a requirement for proficiency in English. We were

told that the program is too new for true specializations differences between the five institutions to have developed.

The present Techniques de la logistique du transport is a new program in its current form but replaced other transportation/logistics programs at a number of institutions. For 20 years before starting the present program in 1998, André-Laurendeau, Garneau, and Lionel-Groulx had offered a transportation and logistics specalization option in the final year of a three-year general business diploma program (Techniques administratives). We were told that the new system results in a greater exposure to transportation and the ability to tailor courses to the specifics of transportation.

Enrollment varies. IMQ has four students in the third year of the program. (which constitutes the first class), 16 in the second, and 22 who entered the program in 1999. André-Laurendeau has 40 students in the second year of the program (the first class) and 45 who entered the program in 1999. Garneau took 72 students into the program in each of its first two years. Second year enrollment (the first second year class) had fallen to 57. At Lionel-Groulx there are currently 45 students in each of the first and second years of the program. Most of these students (at Lionel-Groulx at least)entered directly from secondary school but there is also many adults taking the program. Enrollment for the older transportation option was not available. We note that the specialized courses which make up the transportation/logistics program are not generally available as an option to other business students.[61]

New Brunswick Community College

The New Brunswick Community College (NBCC) at Dieppe offers a concentrated three-year business technology program with a transportation co-op option. The program consists of six academic terms and three co-op work terms with an optional fourth work term during the summer break. Students who have completed the Dieppe program can easily obtain the CITT certification since CITT recognizes the Transportation Option as being equivalent to seven of the ten required CITT courses.

There are approximately 14 to 20 students in each of the three years of the program. In addition, there are 18 to 20 students taking a related one-year logistics and materials handling program: Techniques de distribution et manutention.

In addition to the work terms, the transportation program at Dieppe includes some 48 academic courses:

- Arithmétique appliquée aux affaires
- Atelier coop
- Business and Administrative Writing I and II (2 courses)
- Communication d'affaires
- Comportement organisationel
- Comptabilité de gestion
- Comptabilité I and II (2 courses)
- Comptabilité informatisée
- Douanes
- Droit des affaires
- Droit en transport
- Économie

- Économie des transports
- English Communication Skills
- English Reading Essentials
- English Writing Essentials
- Géographie des transports I et II
- Gestion des affaires
- Gestion des stocks informatisée I
- Gestion du personnel
- Introduction à Internet
- Introduction au chiffrier électronique
- Introduction au marketing
- Introduction au transport
- Introduction aux affaires
- Introduction aux bases de données
- L'essentiel du français écrit
- Logistique et distribution physique I and II (2 courses)
- Mathématiques financières
- Préparation au marché du travail
- Principes d'achats
- Principes généraux de rédaction I
- Rédaction administrative I, II, and III (3 courses)
- Rédaction administrative standardisée
- Relations humaines
- Répartition
- Saisie de texte sur micro-ordinateur (STMO)
- SIMDUT et Hygiène et sécurité au travail (SEHST)
- Statistiques I
- Techniques de transport I, II and III (3 courses).

We note that the program does not include opportunity for students to take any general education or elective courses.

Programs in International Business

Approximately ten colleges offer some form of an *International Business* or *International Trade* program. Most are offered in Ontario and many of these programs have been developed within the last few years.[62] The programs range from one to three years, with the one-year programs typically targeting students who have already earned a diploma in business or some related field. A number of colleges drew our attention to the International Business programs noting the transportation and logistics content. For the most part, however, the transportation and logistics component of these programs is low. Some of the one-year programs include only one or two transportation/logistics course. Some of the three-year programs include more transportation courses.

International Transportation, Logistics and Freight Forwarding Programs

A handful of programs tailored specifically to international transportation, logistics or freight

forwarding were identified under a variety of program names. These tend to be similar to the international business programs but with a much greater emphasis on transportation and logistics; generally half or more of the courses are specifically transportation or transportation related. Often the transportation content deals with documentation, customs and insurance issues.

Other Transportation and Logistics Programs

Other than those noted above, we have identified seven specific transportation and logistics programs offered by community colleges in Canada. In a number of these, transportation and logistics is only a component of a more encompassing Supply Chain Management program.

Transportation as Option within Business Programs

Very few colleges include transportation and logistics courses as options or electives in general business programs. In a few of the general business programs, the transportation course is part of the marketing specialization option. Only one general business program has a logistics or transportation specialization option. At some institutions, general business students may be able to take one of the introductory transportation or logistics courses that are offered as part of an International Business or Logistics program or one of the introductory transportation courses offered in conjunction with one of the professional organizations. This, however, seems to be more an exception than the rule and we do not know the policy of all the institutions.

Transportation Engineering Technology

We have identified a few specific community college level programs in transportation engineering technology (for the most part consisting of roads and highways design and construction). They offer an extensive set of civil engineering and transportation technology courses. Where intramural, such programs generally provide a greater number of class hours than the typical transportation option that is available in university-based Civil Engineering programs. Taking the BCIT *Distance Education* Transportation Systems (Highways) Certificate of Technology program as an example, course topics include:

- Strength of Materials
- Graphical Communication
- Soils Technology
- Aggregates
- Concrete Technology
- Asphalt Technology
- Surveying Highways
- Geotechnical Design
- Highway Construction
- Pavement Construction
- Highway Design
- Pavement Design

- Traffic Technology
- Bridge Inspection
- Transportation Planning

We note that there are probably more transportation and traffic engineering technology programs than identified by and to us. It is likely that some institutions offer such programs but did not bring them to our attention–given that the Terms of Reference information that we provided really did not include them.

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[60] The educational function of professional and industry associations is addressed below.

[61] Program staff at Lionel-Groulx indicated that the school is trying to meet needs of the industry and that there will be a program (perhaps parts of this one) that will be provided to any person who would like to continue his or her education in transportation logistics. These courses will be provided either in classes within the Cégep or special through specialization courses provided in conjunction with industry.

[62] At least three of the Ontario programs will not start until the fall of 2000.

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PRIVATE SECTOR AND OTHER PROFESSIONAL TRANSPORTATION EDUCATION PROGRAMS

The following table identifies and describes transportation education programs as identified in various institutions. Those for which more detail is provided in the text below are indicated in **bold**.

PUBLIC SECTOR SUPPORTED INSTITUTIONS	
IFGTL–Institut de formation en gestion du transport et de la logistique	**The Institut de formation en gestion du transport et de la logistique was constituted in November 1998 and initially was a Quebec initiative supported by the Ministry of Transportation. See text.**
PRIVATE NOT-FOR-PROFIT ORGANIZATIONS	
APICS–The Educational Society for Resource Management	Offers courses and seminars which touch on transportation and logistics. Different chapters have different educational programs. The Ottawa Chapter, for example, provides CPIM and CIRM certification tutorials and principles courses through Algonquin College.
APTC–Atlantic Provinces Transportation Commission	APTC does not offer any transportation education courses on a regular basis. It does, however, offer workshops on specific topics (for example ITS) as the need arises.
ATAC–Air Transportation Association of Canada	Only educational programs appear to be related to flight training and other technical subjects.
BCISIT–BC Institute of Studies in International Trade	Although we are not sure of the nature of this organization, its main educational activity is in offering the national FITT skills program. (See FITTT below).
CALM–Canadian Association of Logistics Management	CALM promotes logistics-related education, sponsors a number of seminars and other short courses and is the co-sponsor, with York University, of a one-week Executive Program in Supply Chain Management. A review of the material available from CALM indicates that most of its seminars and courses concentrate on logistics and other aspects of supply chain management rather than transportation. Nevertheless, CALM also promotes the transportation education programs of institutions such as the CITT.
CIFFA–Canadian International Freight Forwarders Association	CIFFA offers a Certificate of International Freight Forwarding in conjunction with the Continuing Education departments of Concordia, Humber College, University of Calgary and BCIT. Each module is a two-semester (30 hours each) program. A correspondence version is also offered for students not located in Montreal, Toronto, Calgary or Vancouver. The exam is coordinated by Humber college. Cost is $450 (plus tax) per semester for members ($600 plus tax for non members). Prerequisite for program is secondary school and two years experience in the field. (Module I can be skipped by students with five years experience with a CIFFA member company.) Topics covered in Module I include Ocean Freight, Land Surface Transportation, Airfreight, Transportation Law, Logistics, Supply Chain Management. Module II topics include. Transportation, International Distribution, Negotiations in Logistics, EDI in Transportation. CIFFA also offers some courses in Dangerous Goods Movement,

	some in its own name, some in conjunction with IATA or Canadian Airlines.
CIT–Chartered Institute of Transport	*Encourages education but offers no courses.*
CITA–Canadian Industrial Transportation Association (the old CITL)	Can find no evidence of education programs offered by CITA.
CITT–Canadian Institute of Traffic and Transportation	**Offers a 3-level program in transportation leading to the CITT designation. There are 1,270 students at various levels in the program. See text.**
CMHDS–Canadian Material Handling and Distribution Society	The CMHDS is a national organization that was formed to unite all individuals, professional groups and businesses involved in logistics, materials handling, distribution and management. As part of its mandate the CMHDS promotes professional education. The B.C. chapter sponsors a number of courses in materials management at BCIT, including one in Logistics. The Calgary chapter is one of the sponsors of the SAL
CPLI–Canadian Professional Logistics Institute	The CPLI's mandate includes *"Develop comprehensive training in logistics."* Repeated calls were not returned; however, the CPLI's internet site indicated two courses, *Supply Chain Management* and *Customer-focused Diagnostics.*
CSA–Canadian Shipowners Association	The educational section of the CSA website provides links to the IMQ, the Coast Guard college and other institutions. We have had no response to our inquiry as to whether the CSA offers any transportation courses.
CTHRC–Canadian Trucking Human Resources Council	The CTHRC accredits institutions in the road transport field, develops curriculum, and appears to deliver some training modules itself issuing certificates to graduates. Most courses appear to be of a technical or general business nature.
CTRF–Canadian Transportation Research Forum	Encourages transportation education but does not offer any courses. Provides scholarship to university graduate students.
CUTA–Canadian Urban Transit Association	Offers a variety of training programs including (for 2000) Supervision, Scheduling; Transit planning, Transit AM.B.A.ssador. Labour Relations, and Collective Bargaining.
FITT–Forum for International Trade Training	FITT is the Canadian representative to the International Association of Trade Training Organizations (IATTO). Its Canadian partners include the Alliance of Manufacturers and Exporters Canada, the Canadian Chamber of Commerce, the Canadian Federation of Labour, the Canadian Importers Association, the Canadian Professional Logistics Institute, the Canadian Professional Sales Association and the World Trade Centres Canada. FITT offers an 8-module skills program resulting in the CITP designation. Module 4 of the program (International Trade Logistics) includes transportation. The FITT program is available on-line as well as through the following: Nova Scotia Community College, New Brunswick Community College (St. Andrews), Bishop's University, CEGEP de Drummondville, College de Bois-de-Boulogne, College Francois-Xavier-Garneau, O'Sullivan College, UQAH, Algonquin College, Carleton University, Centennial College, College Boreal, College des Grand Lacs, Fanshawe College, Niagara College, Ryerson, Seneca College, St Clair College, the University of Waterloo., SAIST, Grant MacEwan College, Mount Royal College and the BCISIT. We note that few of these institutions mentioned the FITT program in response to our inquiries.
OMCA - Ontario Motor Coach Association	The OMCA offers a number of seminars and short courses for its members. These courses are of a technical, maintenance or operational nature.

PMAC–Purchasing Management Association of Canada	The PMAC offers a professional certification program based on four principles courses and a six seminar credits. One of the principle courses is Principles of Transportation and Logistics. We were told that it is more of a logistics course than a transportation course, The course was redesigned last year. The principles courses are offered through a number of colleges in universities. Yearly registrations total approximately 600-700 in all courses (based on activity over the last 3 years).
RAC–Railway Association of Canada	**The RAC is developing an *Institute of Railway Technology* which will be a network of Community Colleges and Cégeps which would deliver industry-accredited training. See text.**
SALS–Southern Alberta Logistics Society [The SALS is the Calgary Chapter of the APICS and CMHDS]	Offers certification parchments in Production and Inventory Control Specialist, Warehouse Management Specialist, and Distribution and Transportation Specialist. Two of the courses offered are Distribution Level I and II. These are equivalent to the CITT I and II courses. Classes typically meet once a week for a 12-week session. Also offers eight other related courses in materials management. Classes are held at the DeVery Institute of Technology which also has two logistics courses in its business program.
TAC–Transportation Association of Canada	TAC has no direct education program. It does have a postgraduate scholarship program to support Canadian students in transportation-related fields.
WFTA–World Federation of Trading House Associations	Offers an internet based 11 module program in the practice of international trading. Module 6 is a treatment of transportation and logistics.
The Society for Resource and Supply Chain Management	See SALS
COMMERCIAL ESTABLISHMENTS	
CANAC	In recent years, CANAC has undertaken training of some 20,000 people per year. None of this training is related to economics or planning; rather it is all technical (how to drive a locomotive, how to fix switches, how to operate a crane, and so on). The total training costs are in the range of $15 to $20 million per year. In the past, 80% of the training undertaken by CANAC was for its parent CN Rail. This is expected to be reduced to 40% for CN in future. Most courses are largely provided within Canada and the U.S., with the odd course being offered in Mexico or offshore.
CPCS-Transcom	Has undertaken some non-technical training mainly in the off-shore market. Part of CPCS's overall transportation practice includes technical training. It has also undertaken some non-technical training in the field of transportation economics and management. Most of the CPCS practice is aimed at the overseas market and the company has also mounted some incoming *fellowship* programs.
DeVery Institute of Technology	DeVery is a private school specializaing in technology. The Calgary campus offers a Logistics course (and laboratory) as part of its business curriculum. Some of the other production courses touch on transportation issues. None of the other DeVery campuses appear to offer a similar program. DeVery also provides the classrooms for the SALS courses.

Note: We scanned internet-based lists of private trade schools (including programs offered) and found none that appear to offer transportation although many offer travel and tourism programs as well as technical programs. Nevertheless, our experience with the DeVery Institute's Calgary campus suggests that there may be some additional programs.

Institut de formation en gestion du transport et de la logistique[83]

The Institut de formation en gestion du transport et de la logistique (IFGTL) is still in the development stage. It was constituted in November 1998 and is an ambitious Quebec initiative supported by the Ministry of Transportation. Its mission is the development of knowledge and training of management personnel for the transportation and logistics industry. With a staff consisting of a Director General and Administrative Assistant, the IFGTL is responsible to a 19 member Board of Directors that includes senior Quebec provincial public servants (Ministries of Transport and of Science and Technology), transit, freight carrier and shipper representatives, as well as university and CEGEP representatives Part of the IFGTL's mandate is to work with academic institutions to organize and promote academic training in transport and logistics. It is also to organize symposia, seminars and courses, to collect and disseminate information including information on training programs, and to lobby governments.

The Institute has a committee charged with identifying transportation needs and an academic working group with all Quebec CEGEPs and universities offering a transport or logistics course participating. IFGTL plans to work towards a recognition of 15 university credits for the 3 year CEGEP specialized programs in transport and logistics offered in Quebec. We were told that, as of the autumn of 1999, the following CEGEPs offer specialized transport and logistics programs approved by the Quebec Ministry of Education.

- André-Laurendeau,
- Lévis-Lauzon,
- Lionel-Groulx,
- Rimouski and
- Xavier-Garneau.

The Institute is presently offering a series of two-day professional development seminars. These seminars will be offered at different places and times. Thus the dates and indications of Montreal or Quebec City should be only taken as illustrative.

> *Marketing de services pour les entreprises de transport des personnes: 13-14 October, 1999* in Montreal and *19-20 January, 2000* in Quebec
>
> *Methodes de planification et d'optimization du transport des marchandises: 27-28 October, 1999* in Montreal and *22-23 February, 2000* in Quebec
>
> *Enjeux strategiques et gestion des ressources d'une entreprise de transport: 11-12 November, 1999* in Montreal and *15-16 March, 2000* in Quebec
>
> *Indicateurs de performance applicables au secteur du transport des marchandises et de la chaine logistique: 24-25 January, 2000* in Montreal and *25-26 October, 1999* in Quebec
>
> *La gestion de la chaine logistique: enjeux strategiques et approches contemporaines: 13-14 April, 2000* in Montreal and *9-10 February, 2000* in Quebec
>
> *Criteres de selection et d'implantation de logiciels d'aide a la decision en logistique et transport: 1-2 May, 2000* in Montreal and *25-26 April, 2000* in Quebec

Prevision et gestion des approvisements; concepts, methodes et outils d'aide a la decision: 16-17-18 Fevruary 2000 in Montreal and *23-24-25 November, 1999* in Quebec

The Institute's schedule also includes 4 special seminars, and it hopes to offer some two to three week long courses specialized in logistics–similar to the ones offered by Canadian Association of Logistics and Management (CALM) throughout the rest of Canada. It is planned that these courses will eventually lead to a certificate issued by a professional organization such as CALM.

We note that the IFGTL initiative remains in an early stage and that it will be some time before its success can be determined. We also note that the Institute's mandate is considerably broader than that of our study. Regardless, the IFGTL demonstrates a level of Quebec government commitment to transportation education that is not approached in any other province. Further, we note that Quebec's payroll and corporate tax systems provide a special incentive for industry in that province to invest 1% of gross wages and salaries in employee training.

Canadian Institute of Traffic and Transportation (CITT)

The Canadian Institute of Traffic and Transportation (CITT) is a not-for-profit organization with a full administrative staff, which is accountable to the members through an elected volunteer board of directors. For more than 40 years, the CITT has been a leading provider of professional development and certification in transportation, logistics and distribution management to professionals across Canada. The CITT program is based on *"the continuous development of our membership using leading-edge educational programs and development opportunities while focussing on the needs of our individual and corporate stakeholders.*

CITT's program–open to students who have completed Grade XII or who have equivalent work experience–consists of ten courses[64] at three different levels. Upon completion of the program, students are entitled to use the CITT designation.

Level 1: Skills Training

Two mandatory courses: Distribution I and Distribution II. These are 30-hour courses which cover a background, understanding and current technical information on all modes of transportation and intermodalism as well as transportation intermediaries. The second course explores concepts of physical distribution and logistics including contracts, dangerous goods, and the transportation regulatory environment.

Level 2: General Business

Students must complete any five of the following courses: Administration, Business Strategy, Commercial Law, Finance, Introductory Economics, Marketing, Organizational Behaviour, Risk Management Process, and Writing for Business.

Level 3: Professional Development

Students must complete Physical Distribution/Logistics plus any two of: Logistics Decision Modelling, Transportation Economics, or Transportation Law.

CITT level 1 courses (Distribution I and II) are offered by correspondence, the internet and through a number of educational institutions[65] including:

- British Columbia Institute of Technology (Burnaby)
- Southern Alberta Logistics Society (Calgary)
- Kelsey Institute--SIAST (Saskatoon)
- Wascana Institute--SIAST (Regina)
- Red River College (Winnipeg)
- New Brunswick Community College (Saint John and Dieppe)
- Conestoga College (Kitchener)
- Confederation College (Thunder Bay)
- Fanshawe College (London)
- Lambton College (Sarnia)
- Seneca College (Toronto)
- Sheridan College (Brampton and Oakville)
- CEGEP Lionel Groulx (Ste-Thérèse).

Level 2 courses are also offered by correspondence. The CITT also recognizes many equivalent college and university courses as long as the course description for a given course is similar.

Level 3 is offered by correspondence and some courses may be available at colleges or universities. Depending on the arrangement between the CITT and the institution, candidates may automatically receive credit, or candidates may have to apply for exemptions. Institutions where level 3 courses are available include (but are not restricted to:

- University of Calgary, Van Horne Institute (Calgary)
- University of Manitoba, Transport Institute
- Sheridan College (Brampton and Oakville).

For CITT-sponsored courses the fee for each course is $481.50 (including GST).

During the 1998/99 academic year, there were close to 1,270 students registered in various levels of the CITT program.

Railway Association of Canada *(Institute of Railway Technology)*

In 1999, the RAC Board of Directors approved the creation of the *Institute of Railway Technology* (IRT) as a permanent part of the RAC mandate. The IRT will not be a "bricks-and-mortar" building, but rather a network of community colleges and CEGEPs across Canada. These will be accredited by the RAC to deliver railway technical training. The RAC will not deliver the training itself. For the most part, it appears that the IRT will concentrate on technical areas such as locomotive operation and signal maintenance. It is not intended to venture into transportation planning and other "soft" areas.

The railway industry had traditionally trained its own technical employees on a company-by-company basis. The industry has decided that nationally accredited programs will provide a higher standard for all of Canada's railways, thus improving an already outstanding safety record. The IRT will also

allow the industry to target its training dollars more efficiently.

The establishment of the IRT is seen as major initiative for the Association but it is only at the initial stages. Staff are currently analyzing the state of technical training both within the industry and the programs that are being offered by training institutions.

In the development of the IRT, several key issues have been identified that must be further developed, such as workforce planning, occupational profiles, curriculum development and accreditation. Work teams comprised of experts within the industry have been created to tackle these issues. Several training institutions will also provide advice and input throughout the process of setting up the IRT.

We were told that programs will be delivered by colleges and technical institutes across Canada.[66] Funding will be derived from a combination of provincial grants and student tuition, and the IRT will work with delivering institutions to negotiate student loan eligibility with government bodies. At their own discretion, individual railways may also choose to fund programs, or support students through bursaries and/or scholarships.

IRT programs will take the form of training designed for railway employees and pre-employment training. Pre-employment railway training programs will be predominantly competency based. The subjects that will be covered in these programs will depend on the required skills and knowledge identified in the respective occupational profiles developed with industry. The industry envisions two common cores of courses. The first will be similar to the "employability skills" identified by the Conference Board of Canada. The second common core will address general railway topics, such as the history of the railway industry in Canada, its impact on the Canadian economy, etc.

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[63] We obtained our information on the Institute through an in-person interview with Mr. Paul Corriveau, Executive Director of the Institute, from Institute brochures and from the internet. All of the source material used was in French; what we provide here is not a complete translation of any of the IFGTL literature–merely a very abbreviated English interpretation of some if it.

[64] For university or college graduates, the program may be reduced to five courses. There is also an accelerated program available to students with ten years management experience in transportation and distribution.

[65] Some of these institutions offer the CITT courses as part of their continuing education mandate, while others offer the CITT courses or the equivalent as part of a regular curriculum in transportation or logistics. In the later case, the educational institution has made arrangements with the CITT for successful students to also receive CITT credit.

[66] RAC staff mentioned a number of institutions which have transportation courses and programs as being included in the negotiations for setting up the IRT.

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Appendix A

TERMS OF REFERENCE

Inventory of Professional Training in Transportation

1. BACKGROUND

The participation of knowledgable independent specialists, academics and other professionals, is an important component of Canadian transportation policy development. These transportation experts participate in transportation policy discussions directly through the media, through their research and through the advice they provide to governments and other interested persons and organizations. Transport Canada is concerned that the aging cadre of these experts might not be being replaced by a new generation of experienced specialists. On a more fundamental level, several persons and organizations have suggested that the availability of professional education in transportation and university transportation centres in Canada is not adequate and that there is a shortage of the qualified personnel required by governments and the transportation sector.

2. OBJECTIVE

To prepare an inventory of professional education in transportation in Canada.

3. SCOPE

The inventory is to concentrate on centres and foci of post-graduate training and research in transportation. It should also identify specialist programs at the university undergraduate and community college/Cégep levels. Private sector courses offered to industry and internal training programs offered by transport operators should also be sampled.

For the purpose of the present inventory the *transportation* field is defined as relating to transportation policy and law, and transportation engineering, planning and systems including their economics, safety and social, economic and environmental impacts. Training related to the design, construction and operation of infrastructure or vehicles is excluded.[67]

4. STATEMENT OF WORK

4.1 Summarize the evolution since 1986 of the university transportation training focused on centres at:

- Dalhousie University
- University of New Brunswick
- University of Montreal
- Carleton University
- Queen's University
- University of Toronto/York University
- University of Waterloo
- University of Manitoba
- University of Calgary
- University of British Columbia

Initial contact with centre personnel should be by telephone/email. Where interest in in-depth discussion is expressed, the consultant will personally visit transportation centres personnel at Dalhousie, U.N.B., Montreal, Manitoba, Calgary and UBC.

4.2 Through telephone, fax, mail and the internet, identify organizations providing transportation training and training programs under the following categories:

- university graduate transportation programs
- university undergraduate transportation programs
- distinct areas of transportation specialization within other university engineering, social science and business programs[68]
- community college/Cégep/institutes of technology level transportation training programs
- non-degree professional courses in transportation offered by universities and colleges
- programs at other publicly-funded institutes
- programs and courses offered by private for-profit organizations
- professional programs offered by industry or professional associations and institutes (eg CITT)
- in-house training offered by transportation operators and government departments

4.3 Describe each identified training program. This should include program/course content (including any changes over time), and the history of the courses including enrolment figures.

4.4 Prepare a draft inventory and circulate it to named organizations and other interested persons, soliciting information regarding mistakes and omissions.

4.5 Prepare a brief paper (not for publication) interpreting the information of the inventory. In particular, conclusions as to changes in the aggregate supply (quantity and content) of relevant training in Canada between 1986 and 1999 would be drawn.

4.6 Prepare and submit a final inventory report in electronic form (MS Word Version 6.0 or higher).

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[67] This definition has been adjusted after the fact by the consultant (with concurrence of Transport Canada project manager) to include the words *engineering, planning and* between the words *transportation* and *systems.*

[68] Single courses offered by universities and colleges to business, engineering and other students that provide introductory exposure to transportation, but would not constitute a transportation program or specialization are excluded.

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Appendix B

QUESTIONS FOR UNIVERSITY TRANSPORT PROGRAMS

November 1, 1999

For universities with specific transportation programs, we are seeking to assemble the following information. Importantly, what follows is a list and not a questionnaire. For some programs, all of the items that we list below will be readily available; for others, its assembly might prove a burden. In the latter instances we only ask for information that can be provided without undue effort, and in the form (s) in which it is readily available. We will take what can be conveniently provided.

Description of degree/diploma transportation programs (Ph.D., M.B.A., other Masters, diploma, undergrad, etc. offerings should be treated as separate programs.)

- history
- summary of program content
  - transportation courses (offered 1998-99)
    - required for degree/diploma
    - optional
  - other course requirements
- enrolment (current or latest year)
  - full time
  - part time
- number of degrees/diplomas awarded
  - 1998-99
  - earlier years (to 1986 if feasible)
- current and historical funding
  - internal (from tuition fees, normal government support, etc.)
  - external (any special grants or contracts)
- formal associations with the transport sector

Description of any non-degree/diploma professional transportation training and short courses offered.

- history
- summary of program content
- enrolment
  - 1998-99
  - earlier years
- current and historical funding

Identification of faculty members currently providing transportation instruction (including part time, adjunct, post-doctoral fellows)

- name
- academic department
- qualifications
- % of time as faculty
- % of teaching load represented by transportation courses

grad, undergrad and non-degree courses taught
content (including any changes over time)
history of the course
enrolment for 1999
graduate students supervised
research activity
grants, contracts, PDF, endowed chair

Graduate students currently registered in transportation programs

program of registration (Ph.D., MASc, M.B.A. etc.)
date program commenced
full time/part time
previous university(ies)/college(s) and degree(s)
province/country of permanent residence
thesis topic/title or area of concentration if applicable
scholarship/fellowship/employer support

Future plans and identified needs and deficiencies, including market demand for transportation graduates

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Notre firme a été mandatée par Transports Canada pour faire un inventaire des programmes universitaires, et collégiaux spécifiques au transport. Ce qui suit n'est donc pas une liste de questions mais plutôt, une liste de points devant servir à constituer un inventaire des programmes existants. Pour certains, la liste des items peut constituer une tâche ardue alors que pour d'autres, les informations recherchées existent et sont relativement accessibles.

Nous espérons, par contre, que le niveau d'efforts pour fournir les informations demandées soit minime et que l'information demandée est relativement facile d'accès.

Description du diplôme/certificat en transport:(Toutes les catégories devraient être traitées séparément e.g. Doctorat, Maîtrise, Baccalauréat, Certificat, etc.)

Historique
Sommaire du contenu du programme
Cours en transport offerts en 1998-99
Cours exigés pour un diplôme
Cours optionnels
Autres cours requis
Inscriptions (actuel ou antérieur)
Plein temps
Temps partiel
Nombre de diplômes et certificats remis
1998/99
Années antérieures si possible (1986 à 1998/99)
Financement actuel et historique
Interne (frais de scolarité, support gouvernemental régulier,etc.)
Externe (contrats ou subventions spéciales)
Lien formel avec le secteur des transports

Description de toute formation et cours offerts en transport ne menant pas à un diplôme ou à un certificat:

Historique
Description sommaire du contenu du programme
Inscriptions
1998-99
Années antérieures
Financement actuel et historique

Identification du corps enseignant impliqué présentement dans l'enseignement de sujets touchant le transport: (Incluant les enseignants à temps partiel, étudiant au programme post-doctorat, etc.)

Nom
Département
Qualifications
% de temps à la faculté
% de temps à enseigner un sujet touchant les transports
Cours donnés au 1er cycle, au 2ème cycle et tout autre cour
Contenu du cours (incluant les changements au cours des années
Historique de ce cours
Nombre d'inscriptions pour 1999
Nombre d'étudiants de 2ème cycle sous sa supervision
Activités de recherche
Subventions, contrats, Chaire, bourse post-doctorat, etc

Étudiants de 2 ème cycle présentement inscrits dans des programmes en transport:

Inscription (Doctorat, Maîtrise, M.B.A., etc.)
Date du début de ce programme
Plein temps vs temps-partiel
Institution antérieure
Province / pays de résidence permanente
Sujet de thèse – titre ou domaine d'intérêt si possible
Bourses ou autre appui financier

Plans pour l'avenir:

Besoins identifiés
Améliorations souhaités
Demande pour des étudiants diplômés d'un programme en transport

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Appendix C

SELECTED COMMENTS

COMMENT OF THE UBC CENTRE FOR TRANSPORTATION STUDIES

[lightly edited]

Market demand for transportation graduates

The market demand for transportation graduates per se has been only modest in recent years. There are a limited number of entry positions for B.Com.s, and UBC has had no difficulty placing M.Sc. students, but the numbers have not been large. Transportation companies have been in *downsizing mode* for some years. Nor have Governments been hiring many graduates for some time, although this could change in the next few years as 'boomers' start retiring early.

The major employment opportunities are in logistics and supply chain management. The market is excellent. In recent years the program has been oriented more to these teaching areas. The idea of co-op education is also becoming increasingly popular. A co-op undergraduate program has been introduced but kept to a minimal size for the time being.

We also see an international demand for transportation analysts with training in economics and finance. This is a target area for expanding the M.Sc. program. This has been constrained by inadequate funds which leave UBC unable to offer some of the critical courses which would be the heart of such a program. The tight budgets mean that one cannot guarantee that courses will be offered if enrollment is below a required minimum, and the latter has been rising steadily due to funding constraints. The B.C. tuition freeze means that it is almost impossible to finance new graduate courses unless a large number of overseas students (who pay higher fees) can be attracted.

Identified needs and deficiencies

For universities everywhere, inadequate funding is of major concern no matter what subject is addressed. That said, there are some specific problems facing UBC Commerce which are particularly important for transportation programs.

Inadequate funding for faculty

UBC in particular is trying to continue to be a true world-class research university. To do this it is essential to attract the highest calibre faculty and students. There are two obstacles to attracting top faculty: (1) the low Canadian dollar; this is a handicap to all Canadian universities and non-export businesses; (2) salaries are not competitive even if the Canadian dollar were to rise substantially. The latter is of particular concern. The level of the dollar is something that no single agency can do anything about. But it is difficult to offer competitive salaries even ignoring the low Canadian dollar. It

is common to pay new young professors more than those who have been on faculty for many years, essentially gambling that existing faculty will stay even though they are paid about the same–and often less–than new Ph.D.s. This *"salary compression"* has been a fact of life at UBC Commerce for several years now. But the further difficulty is that it is still extremely difficult to retain young people. UBC is a recognized target for *raiding* by universities around the world.

The answer to the low salaries has been to try to attract endowments for *'top up'* funding, sufficient to augment the base salary so that top people can be attracted. These 'professorships' are a potentially attractive prospect for transportation because they effectively mean that particular fields of study, such as Transport Policy, can be promoted without having to fund the full costs of a faculty position. Universities, particularly top ranked universities who are anxious to be able to attract top people, are willing to go out of their way to accommodate donor's requests. A sum of $30-40,000 per year is sufficient to establish a *'professorship'* in a particular field. This is in contrast to the needed endowment of close to $2 million to fully fund a *Chair*. It is also important to recognize that both "junior" and "senior" *professorships* are necessary. It is important to be able to attract bright young faculty and not just those at the senior level. The presence of top senior faculty is a major factor in attracting top young faculty, but retaining the young faculty requires that they receive salaries at least not far below what they can obtain elsewhere.

As noted earlier, despite its importance to the economy, transportation is not a subject which will attract large numbers of students. Universities will find the money necessary to support the highly popular programs. But it is much more difficult for universities to justify more than minimal funding for less popular programs. This provides an opportunity for outside support to have significant impact because funds can be targeted to provide incremental impact on a specialized field such as transportation.

Funding for students

An important goal of any university and program is attracting top students, whether at the graduate or undergraduate level. UBC has done very well in attracting top graduate students. The calibre of the undergraduate students is also high, although they come primarily from the Lower Mainland of B.C., and hence that student body does not have the geographic diversity that one would expect at a major university. The University and Faculty of Commerce have identified this shortcoming and are working to improve student recruiting at the undergraduate level. We have been successful at attracting a number of undergraduate awards and scholarships.

UBC also has a limited number of graduate awards. Students often are successful at attracting scholarships, particularly the Ph.D. students. The most important type of finance needed is research *assistantships*, i.e., opportunities to work on projects with faculty members. This fosters both the teaching and the research roles of the university. What is needed are some awards which can be specified in advance to attract students to the program, so that a scramble for research funds once students are already on campus can be avoided.

The importance of student awards will be increasing in a couple of years. This is because, at present, the tuition levels are quite low (approximately $2500 per year at UBC) relative to the total costs facing a student to go to graduate school. However, it is expected that the provincial tuition freeze will be removed and tuition fees rise substantially. This will increase the burden facing graduate students and make funding even more important. Hence, the importance of graduate fellowships, which are already crucial for most students to go to graduate school, will become even

more important within a couple of years.

In brief, the availability of scholarships and/or research *assistantships* will be an important factor both in enabling students to attend graduate school, and to attract them to particular schools and particular programs.

A plan for faculty succession in transportation

Like many universities, UBC is characterized by an aging faculty. There will be substantial turnover in the next few years. Professor Trevor Heaver has already taken early retirement and the current Centre for Transportation Studies Director (Bill Waters) will do the same in 2001. However, they both plan to continue active involvement with CTS research activities so the problem of losing faculty is not as serious as might first appear. Nonetheless, the long term health of transportation studies at UBC and the country generally requires that top quality new faculty be attracted to the field. As noted above, the teaching program is reorienting to logistics and supply chain management. As long as student enrollment is satisfactory, faculty will be recruited to man these courses (providing the problem of uncompetitive salaries can be overcome). But the objective is to do more than sustain minimal faculty commitment. Transport studies remains an integral part of supply chain studies.

But the outlook for faculty in transportation studies per se is more problematic. As important as transportation is to the economy, and as important and controversial as transportation policy issues are, universities find it increasingly difficult to justify faculty in specialized studies such as transportation. The solution is two-fold. One is to attract interest in transportation by faculty whose primary research interests are elsewhere. This can be accomplished by the availability of research funds and some promotion by agencies such as the CTS.

The additional solution is to obtain full or partial funding for chairs or "professorships" in the field. This can solve the problem of uncompetitive salaries and will make it possible for universities to justify classes in transportation subjects even if the enrollment is not as high as in more popular courses. Given the present high recognition of transportation expertise at UBC, we have a window of opportunity to pursue this plan. We have recognized senior faculty who attract interest by younger research-oriented faculty. If the funding and recruiting efforts are successful over the next few years, UBC can retain and even strengthen its long-standing expertise in transportation.

COMMENT OF PROFESSOR RON RICE OF MCGILL UNIVERSITY

[lightly edited]

Professor Rice offered two general observations on transportation education in Canada. First, the universities reaching a critical period where the legacy of the Pickersgill/Canadian Transport Commission initiative in 1969 will fade away. The staff at the original Transportation Centres are retiring and there is no focus on replacement. Yet, Professor Rice noted that *there are still transport issues and challenges to be addressed in this country of Canada and in its relationship to the global economy.*

Second, *we still haven't adequately tackled the issue of inter-disciplinarity in transportation. We have good programs with defined areas of specialty (which is quite appropriate), but we need more*

networking, to allow for an understanding of the broader context which is so essential to transport problem-solving.

COMMENT OF DR. BARRY E. PRENTICE, DIRECTOR, TRANSPORT INSTITUTE, UNIVERSITY OF MANITOBA

At the very time that the Government of Canada was discontinuing its financial support for transport education at the universities, the Government of the United States was beginning to direct support for transport education to its universities. The recent U.S. legislation for transportation development includes US$228 million in funding over five years for transport education at colleges, universities and transport institutes. As a result, professional development in the transport and logistics fields in the U.S. is well advanced, and the industries employing these graduates. One brand name, Walmart, illustrates the competitive power of superior logistics. The longer this managerial and research talent gap is permitted to exist, the greater will be the competitive disadvantage of Canadian carriers and shippers vis a vis their U.S. counterparts.

We must move soon to develop professional schools of transportation across the country. At the present time, Canadian transportation industry is protected by an undervalued currency exchange rate. As the Canadian dollar rises, the lack of professional training in this industry will start to become evident.

COMMENTS OF ALAN CLAYTON UNIVERSITY OF MANITOBA DEPARTMENT OF CIVIL ENGINEERING

[lightly edited]

We are actively involved in arranging for and having our graduate students participate in research internships at several highly regarded institutes as part of their study/research program. These include the University of Michigan Transportation Research Institute, the Texas Transport Institute, and the Battelle Memorial Transport Institute. Notice that no such institutional internships have been created in Canada by anybody–and this is not for the lack of us trying.

COMMENTS OF THE VAN HORNE INSTITUTE CENTRE FOR TRANSPORTATION AT THE UNIVERSITY OF CALGARY

The Van Horne Institute recognizes the structural and investment challenges in developing a series of courses in transportation, and related regulatory affairs, that will give students a basic grounding in those subjects required to commence their career in transportation. The Institute recognizes that it will require a gradual building process of courses and research at the educational organizations with which it is affiliated, and that additional resources in staff and infrastructure would be required for the Institute to move more quickly to achieve its stated objective.

As an alternative to exclusively building new infrastructure, the western ports and corridors initiative has been developed by industries stakeholders and the four western provincial governments. In essence, the Van Horne has been asked to formulate a business plan that would contemplate the

linking together of centres of expertise in transportation that currently exists at universities such Manitoba, British Columbia, Alberta and Saskatchewan. The links would be affected through the expanding technology of distance education by linking existing modules of transportation courses from across Western Canada. A super curriculum of courses would be created that students can access and graduate from with a major degree in transportation, and related regulatory affairs, in accordance with the requirements of the University in which they are registered.

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